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# USSR Report

CHEMISTRY

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USSR REPORT  
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VESTNIK MOSKOVSKOGO UNIVERSITETA: KHIMIYA, No 1,  
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100



UDC 678.01:53

MOLECULAR STRUCTURE AND PROPERTIES OF CARBON CHAIN FLUORINE-CONTAINING POLYMERS

Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR, SERIYA B: GEOLOGICHESKIYE, KHIMICHESKIYE I BIOLOGICHESKIYE NAUKI in Russian No 3, Mar 84 (manuscript received 13 Oct 83) pp 51-54

PRIVALKO, V.P., TARARA, A.M. and KIRICHEK, B.I., Institute of Macromolecular Weight Compounds, Ukrainian SSR Academy of Sciences, Kiev

[Abstract] Mathematical reasoning is provided for the observed changes in free volume, compressibility, viscosity, and other parameters of hydrocarbon macromolecules as the hydrogen atoms are replaced by the bulkier fluorine atoms. Analysis for a series of compounds going from polyethylene to polychlorotrifluoroethylene via intermediate polyvinylfluoride and polyvinylidenefluoride polymers showed that crystalline packing of the latter polymers was denser than that of polyethylene, and that the crystalline lattice of the latter also exhibited greater compressibility. The thermodynamic parameters for these compounds are summarized in tabular form, and also show that polychlorotrifluoroethylene exhibited certain deviations from the other compounds in the series due to the presence of a bulky chlorine atom. This report represents the first quantitative description of anomalous changes in the thermodynamic parameters of carbon-chain fluorine-containing polymers in the polyethylene to polychlorotrifluoroethylene series. Figures 3; references 16: 6 Russian, 10 Western.  
[235-12172]

## BIOSYNTHESIS AND METABOLISM OF SOME MATRINE ALKALOIDS IN GOEBELIA PACHYCARPA

Tashkent KHIMIYA PRIRODNYKH SOYEDINENIY in Russian No 1, Jan-Feb 84 (manuscript received 25 Oct 82) pp 3-12

ABDUSALAMOV, V. A., Tashkent Order of Labor Red Banner State University imeni V. I. Lenin

[Abstract] Discussion of aspects of biosynthesis, metabolism and interconversion of some matrine series alkaloids in *Goebelia pachycarpa* Schrenk. is based on a review of the literature and some research by the author. It is concluded that lysine and cadaverine are possible precursors of *Goebelia pachycarpa* S. and that alkaloids of the matrine series do not undergo intramolecular regroupings upon interconversion. A diagram of biosynthesis of some alkaloids with a matrine shell in *Goebelia pachycarpa* is shown and discussed. References 73: 35 Russian, 38 Western.  
[239-2791]

## ALKALOIDS OF PAPAVER ARENARIUM

Tashkent KHIMIYA PRIRODNYKH SOYEDINENIY in Russian No 1, Jan-Feb 84 (manuscript received 11 Jan 83) pp 76-79

ISRAILOV, I. A., MANUSHAKYAN, M. A., MNATSAKANYAN, V. A. and YUNUSOV, M. S., Order of Labor Red Banner Institute of the Chemistry of Plant Substances, UzSSR Academy of Sciences, Tashkent

[Abstract] Separation of alkaloids from *Papaver arenarium* M. B., gathered in the period of florescence in the Lake Sevan region is described and discussed. Macrostromin, glycomarine, chailantifoline, sevanine, arenine and two isomers of N-oxide of macrostromin, not described in the literature, were isolated. Their isomerization under thermal conditions is described. References 10: 5 Russian, 5 Western.  
[239-2791]

## ALKALOIDS OF DICENTRA

Tashkent KHIMIYA PRIRODNYKH SOYEDINENIY in Russian No 1, Jan-Feb 84 (manuscript received 11 Jan 83) pp 79-81

ISRAILOV, I.A., MELIKOV, F.M. and MURAV'YEVA, D.A., Order of Labor Red Banner Institute of Chemistry of Plant Substances, UzSSR Academy of Sciences, Tashkent

[Abstract] Study of alkaloid composition of *Dicentra spectabilis* L. from plants gathered in the period of florescence at Pyatigorsk Pharmaceutical Institute Botanical Garden and *Dicentra peregrina* Rudolph from plants gathered in the period of florescence near Lake Sakhalin is described and discussed. Isolation of 0.17 percent of the sum of alkaloids from epigeal parts and 0.25 percent of the sum of alkaloids from the roots of *Dicentra spectabilis* L. by methanol extraction was carried out with separation of dihydrosanguinarine, sanguinarine, sculerine, chailanifoline, corydine and protopine. 1.8 percent of the total alkaloids was isolated from epigeal parts of *Dicentra peregrina* Rudolph and 1.51 percent was isolated from the roots by chloroform extraction. Alkaloids isolated include: isocoridine, coridine, dicentrine, protopine, dihydrosanguinarine, sanguinarine, cheleritrine, bicuculine, lederine, sculerine, isoboldin, predicentrine, reticuline and allocryptopine. References 7: 4 Russian, 3 Western.  
[239-2791]

## ALKALOIDS OF PAPAVER ORIENTALE

Tashkent KHIMIYA PRIRODNYKH SOYEDINENIY in Russian No 1, Jan-Feb 84 (manuscript received 19 Jan 83) pp 81-83

ISRAILOV, I. A., MANUSHAKYAN, M. A., MNATSAKANYAN, V. A. YUNUSOV, M. S. and YUNUSOV, S. Yu., Order of Labor Red Banner Institute of the Chemistry of Plant Substances, UzSSR Academy of Sciences, Tashkent

[Abstract] Study of alkaloid composition of epigeal parts of *Papaver orientale* L. from plants gathered in the period of florescence in the Lake Sevan region is described and discussed. Alkaloids isolated include: orientalidine, mecambidine, isothebaine, bracteoline and newly discovered orientine, O-methylisothebaine and orientidine, for which the structure is established. References 5: 3 Russian; 2 Western.  
[239-2791]

NEW SPECIES OF LECTIN-CONTAINING PLANTS

Tashkent KHIMIYA PRIRODNYKH SOYEDINENIY in Russian No 1, Jan-Feb 84 (manuscript received 13 Jan 83) pp 86-88

LEVITSKAYA, S. V., ASATOV, S. I. and YUNUSOV, T. S., Order of Labor Red Banner Institute of the Chemistry of Plant Substances, UzSSR Academy of Sciences, Tashkent

[Abstract] Study of 151 species of plants of Central Asia revealed the presence of lectins in 23. Immunochemical specificity of extracts was determined and carbon-bonding specificity was determined for some of the species.

References 6: 4 Russian; 2 Western.

[239-2791]

UDC 543.852

DIRECT DETERMINATION OF TOTAL ACIDS IN OLEORESINS AND ROSIN OF CONIFERS

Novosibirsk IZVESTIYA SIBIRSKOGO OTDELENIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKIKH NAUK in Russian Vol 1, No 2, Jan-Feb 84 (manuscript received 3 Feb 83) pp 122-125

FADEYEVA, V. P., ARTEMOVA, G. N. and SHMIDT, E. N., Novosibirsk Institute of Organic Chemistry, Siberian Department, USSR Academy of Sciences

[Abstract] Conifer oleoresin is a complex mixture of terpenoids containing aliphatic, hydroxylic and resin acids, the latter being the basic components of the acidic portion of oleoresin. Determining the amount of resin acids in oleoresin and rosin by a spectrophotometric micromethod is the subject of the present article. The method is based on the formation of hydroxamic acids by the reaction of the carboxyl group with hydroxylamine in alcohol in the presence of dicyclohexylcarbodiimide. Test with individual abietic and isopimaric acid showed the linear dependency of optical density on acid concentration. Temperature and duration were crucial in the experiments, with optimum values of 60°C and 30 minutes decided upon. Calculated methodology was tested using artificial mixtures of oleoresins and rosin, with relative standard deviation of about 1.3%. Figure ; references 7: 5 Russian, 2 Western.

[224-12131]

UDC 541.183:541.422.4

IR SPECTROSCOPIC STUDY OF CARBON CATALYST

Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol 50, No 3, May 84 (manuscript received 21 Jun 83) pp 254-257

LARINA, A. A., TARKOVSKAYA, I. A. and CHOTIY, K. YU., Physical Chemistry Institute, UkSSR Academy of Sciences, Odessa

[Abstract] The IR spectra of various carbon polymers was determined in KBr. Styrene divinylbenzene, oxidized with HNO<sub>3</sub>, NaClO, H<sub>2</sub>O or air and phenol formaldehyde resin oxidized with HNO<sub>3</sub> were subjected to 200, 400 or 600° in an

argon atmosphere. Chemical analysis indicated the presence of strongly and weakly acidic carboxyl groups, as well as phenolic groups, on the surface. Thermal treatment reduced the number of oxygen containing surface groups and the corresponding catalytic activity of the samples in the sucrose inversion and ethyl acetate hydrolysis reactions. The decrease in intensity of the band at  $1740\text{ cm}^{-1}$  in the IR spectrum, due to the carboxyl group carbonyl, was progressively greater at the higher heat treatment temperatures. The styrene divinylbenzene differed from the phenol formaldehyde in the presence of hydrogen bonds, distribution of acidic functional groups and catalytic activity. The results indicate that carbon oxidation proceeds in a nonhomogeneous manner, giving varying amounts of carboxyl, lactone and hydroxyl groups on the surface, depending on the conditions used. The catalytic activity of the samples is directly connected with the presence of these groups. Figures 2; references 17: 9 Russian, 8 Western.  
[217-12126]

UDC: 541.127+547 6.118

#### CATALYTIC EFFECT OF PHOSPHORUS DITHIOACIDS IN IODINE-AZIDE REACTION

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHNLOGIYA in Russian Vol 27, No 2, Feb 84 (manuscript received 13 May 82) pp 181-183

GABDULLIN, M. G., GARIFZYANOV, A. R. and TOROPOVA, V. F., Department of Analytic Chemistry, Kazan State University imeni V. I. Ul'yanov-Lenin

[Abstract] There is interest in the study of the catalytic effect of a number of related sulfur-containing compounds in order to determine the mechanism of the catalytic effect of sulfur-containing compounds in the iodine-azide reaction. With this purpose, the present work studied a number of dithiophosphorus and dithiophosphonous acids with various substituents at the phosphorus atom. The reaction rate was determined by the change with time of optical density of the iodine-starch solution at  $\lambda=610\text{ nm}$ . Based on the results obtained it is stated that an increase in volume and branching of substituents at the phosphorus atom in sulphenyl iodide leads to a decrease in the rate of interaction with the azide ion. References 8: 5 Russian, 3 Western.  
[221-6508]

## BIOCHEMISTRY

UDC 613.633:622

### CAUSES OF ANTHRACOSIS

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 2, Mar-Apr 84 (manuscript received 9 Feb 83) pp 68 70

KUKHARENKO, T. A. and DINKELIS, S. S., Institute of Combustible Minerals

[Abstract] The lack of clear understanding of anthracosis pathogens of coal dust prevents both prophylaxis and treatment. Some research has indicated that the milk alkalinity of the human body promotes harmful oxidative hydrolytic decomposition of coal. Processing with water and hydrochloric acid has shown that changes in coal vary, with anthracosis pathogens undergoing more intensive loss of weight and formation of polycarboxylic acids. These coals then contain more aromatic acids than those with a lower stage of metamorphosis. Spectral analysis showed that high-molecular acids dissolved in aqueous alkalis react with human polypeptides. Some of the acids formed during oxidative hydrolytic decomposition of coal in the body were harmful aromatic types. Figures 2; references 6: all Russian.  
[223-12131]

UDC 678.447.42-134.26.615.717

### SYNTHETIC ANTIGENS BASED ON POLYMERIC DERIVATIVES OF COUMARIN

Tashkent KHIMIYA PRIRODNYKH SOYEDINENIY in Russian No 1, Jan-Feb 84 (manuscript received 11 Feb 83) pp 38-43

ABYSHEV, A. Z. and KRYLOV, S. S., Institute of Toxicology, USSR Ministry of Health, Leningrad

[Abstract] Production of synthetic polymeric compounds with properties of full-value antigens based on chemical substances allogenic to the organism, is described and discussed. Results of synthesis and immunological study of 14 derivatives of coumarin and N-vinylpyrrolidone showed that some of these derivatives possess antigenic properties. Results of study of the structure of 7-(2'-bromoethoxy)-coumarin as one of the synthetic antigens produced are presented as an example. Characteristics of viscosity, molecular mass and

chemical composition of the copolymers are determined by physico-chemical methods. Copolymers 7-methoxy-8-(3'-chloro-3'methylbutyl)-coumarin did not produce toxic effect at doses up to 5000 mg/kg and they have sufficiently active groups which permit their use as carriers for producing artificial antigens. References 5: 3 Russian; 2 Western.  
[239-2791]



## CATALYSIS

### TESTING ACTIVITY OF OPEN-PORE ALUMONICKEL-MOLYBDENUM CATALYSTS DURING HYDROPURIFICATION OF COAL DISTILLATES

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 2, Mar-Apr 84 (manuscript received 22 Mar 83) pp 78-84

KRICHKO, A. A., YULIN, M. K., MALOLETNEV, A. S., ARIFULIN, A. S., ZAYDMAN, N. M. and MILOVA, L. P., Institute of Combustible Minerals

[Abstract] With the decline of crude oil reserves and rising production costs, liquefied coal products become increasingly practical, but phenols and nitrogen bases must be removed for many fuel applications. One approach to better hydropurification is to improve catalysts. The present article presents results of tests of activity of broad-pore aluminonickel-molybdenum catalysts used in boiling off coal distillates at 120-230°C. Two of the catalysts had 1.3-2.9% less active components than industrial varieties, but their number of pores with more than 1000 Å radius was 15 times greater. Hydrogen pressure in the flow-through device was 4-10 MPa; temperature range was 340-400°C and hydrogen feed was 400-1000 liters of hydrogen per liter of raw material. The features and effectiveness of the catalysts tested are summarized. The "AS-24" was more effective in eliminating heteroatoms and unsaturated compounds than the currently-used industrial catalyst. The AS-24 catalyst contained 10.5% MoO<sub>3</sub> and 2.6% NiO, with pores larger than 1000 Å covering 0.3 cm<sup>3</sup>/g and relative surface of 130 m<sup>2</sup>/g. It was most effective at 380°C and 6 MPa pressure, material feed of 1.0 hour<sup>-1</sup> and hydrogen rate of 800 l per liter of raw material. With these parameters, 100% of phenols and nitrogen compounds, and 98.4% and 98.5% of unsaturated hydrocarbons and sulfur compounds, respectively, were eliminated. Figures 5; references 8: 5 Russian, 3 Western.

[223-12131]

Co- AND Ni-CONTAINING CATALYSTS OF HYDROCARBON SYNTHESIS FROM OXIDES OF CARBON AND HYDROGEN BASED ON CALCIUM ALUMINATES

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 2, Mar-Apr 84 (manuscript received 4 Apr 83) pp 85-90

LAPIDUS, A. L., BRUK, I. A., YAKERSON, V. I., GOLOSMAN, Ye. Z., SELITSKIY, A. P., MEZHOV, V. D., MAMAYEVA, I. A., SOMINSKIY, S. D. and FRANKFURT, G. I., Institute of Organic Chemistry imeni N. D. Zelinskiy, USSR Academy of Sciences

[Abstract] Shortages of crude oil and natural gas require expanded production of effective catalysts for synthesizing gaseous, liquid and solid hydrocarbons from CO and hydrogen. The present article reports on catalysts based on calcium aluminate from CO and hydrogen for synthesizing aliphatic hydrocarbons. Test production was done at 0.92 MPa at 210-220°C. The catalyst contained 25Co-1MgO and 74 "talum" percent by weight. Cobalt content was varied from 16 to 44%, thus causing some increase in activeness of the system for liquid hydrocarbons. The best yields were with 1% MgO, although quantities of up to 10% were tested. The best yields of all came with a 33Co-3MgO-64"talum" catalyst. Thus the exact proportions of the catalysts were determined to be a key factor in hydrocarbon yield. Selectivity could also be controlled by adjusting proportions and temperature of the process. Figures 2; references 7 (Russian). [223-12131]

UDC 66.046.56:66.097.3:661.872.2:665.642.3.092.147.3

CATALYST TRANSFORMATIONS DURING CATALYTIC PYROLYSIS

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 2, Mar-Apr 84 (manuscript received 18 Aug 82) pp 91-94

TELYASHEV, E. G., KHATYMOV, R. Kh., VALITOV, R. B., MINDIYAROV, Kh. G. and GALIAKBAROV, M. F., Ufa Petroleum Institute

[Abstract] Petroleum processing and use trends show the need for greater use of heavy fractions and distillation residues for lower olefin production through catalytic pyrolysis. The present article reports on use of iron-chromium-potassium catalysts with vanadium oxide for catalytic pyrolysis of vacuum gas oil. Changes were recorded using gamma-resonance spectroscopy and thermal analysis. Temperature was 500°C, feed rate 1 hour<sup>-1</sup>, pyrolysis duration from 30 seconds to 2 hours and weight ratio of raw material to water vapor 1 : 1. Nuclear gamma-resonance spectra and thermal analysis by derivatogram was discussed. Catalyst regeneration was accompanied by roasting removal and oxidation of some reduced iron on the catalyst. The state of the catalyst and the structure of coke deposits depended on catalyst processing and the duration of catalytic pyrolysis, with increased pyrolysis time leading to regularization of coke structure on the catalyst and increased temperature of total calcination. Figures 3; references 11 (Russian). [223-12131]

STUDY OF DEACTIVATION PROCESSES OF PLATINUM CATALYSTS FOR POST-BURNING OF  
INTERNAL COMBUSTION ENGINE EXHAUST GASES

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 2, Feb 84 (manuscript received 23 Jun 82) pp 262-266

GAZAROV, R.A., SAFONOV, S.A., PLAVNIK, G.M., MOISEYEV, V.P., PANCHISNYY, V.I. and MATVEYEV, V.V., Institute of Physical Chemistry, USSR Academy of Sciences

[Abstract] A study of the deactivation processes of platinum catalysts for detoxifying motor vehicle exhaust gases shows that after prolonged operation, the active platinum particles become calcined from the heat, and the aluminum oxide carrier becomes sulfated causing changes in phase composition and porous structure. Figures 2; references 13: 8 Russian, 5 Western.  
[201-12765]

UDC 661.721.4 : 542.943

INFLUENCE OF CERTAIN ADMIXTURES IN FEEDSTOCK ON WORK OF SILVER-ON-PUMICE  
CATALYSTS FOR OXIDATION OF METHANOL

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 2, Feb 84 (manuscript received 18 May 82) pp 353-356

KURINA, L.N., FILICHEVA, I.D. and PAK, N.Ye.

[Abstract] A study was made of the effects of additions of 0.25 to 4% by weight acetone, acrolein and methylethyl ketone (MEK) on the oxidation of methanol to formaldehyde over silver on pumice catalyst. The above products can all normally be expected to be present in raw methanol feedstock in the amounts indicated. The results show that even insignificant amounts of acetone in methanol lower the yield of formaldehyde by 2% while increasing the amounts of CO and CO<sub>2</sub>. Greater amounts of acetone further inhibit formation of formaldehyde. Additions of MEK have an effect analogous to that of acetone, while isobutyric aldehyde, being less thermally stable than the ketones, has an even greater negative effect on methanol oxidation. Figures 4; references 10 (Russian).  
[201-12765]

KINETIC RELATIONSHIPS IN CONVERSION OF n-BUTANOL AND ITS DERIVATIVES OVER  
MOLTEN  $K_2O-V_2O_5-MoO_3$  CATALYST

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 2, Feb 84 (manuscript received 12 Jul 82) pp 369-374

SHAKIROV, I.V., KETOV, A.N. and CHEKRYSHKIN, Yu.S.

[Abstract] By-products in the large-scale oxosynthesis of butanols and 2-ethyl-hexanol currently comprise 20-30% of the total product and they are not being utilized in the best manner. They consist of a mixture of oxygen-containing conversion products of butyric aldehydes and butanols which could possibly be further converted and returned to the production cycle. In the present work results are presented of a study of the oxidation kinetics of n-butanol, n-butyraldehyde, and n-butyl-n-butyrate over molten potassium-vanadium catalysts containing 10% by weight of  $MoO_3$ . Using these catalysts made it possible to conduct oxidative decomposition of the above by-products with significant yields of olefins and aldehydes at short contact times. A drop in decomposition velocity due to the reaction products was observed at high rates of conversion of the initial compounds. Figures 2; references 17: 14 Russian, 3 Western.  
[201-12765]

SILVER, GOLD AND RHENIUM SUPPORTED ON MAGNESIUM OXIDE AS CATALYSTS IN HYDRO-  
GENATION REACTIONS OF ACETYLENIC COMPOUNDS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 2, Feb 84 (manuscript received 19 Jan 82) pp 461-464

SOKOL'SKIY D.V. and UALIKHANOVA, A., Institute of Organic Catalysis and Electrochemistry, Kazakh SSR Academy of Sciences

[Abstract] Data are presented on the catalytic properties of 30% Re/MgO, 50% Ag/MgO, 50% Au/MgO and 50% Cu/MgO in hydrogenation reactions of phenylacetylene and dimethylethenyl carbinol at 373-453°K and 1.0 to 10.0 MPa hydrogen pressure. Silver and gold are second only to copper and palladium in selectivity, being more selective than the other transition metals. Selectivity of rhenium is higher than iridium but less than that of the other metals. At 8.1 - 9.1 MPa the reactions over Ag/MgO and Au/MgO approached first order in respect to hydrogen and zero order in respect to the acetylenic compounds. The apparent activation energy for phenylacetylene hydrogenation over these catalysts comprises 46-63 KJ/mole. References 7: one Russian, 6 Western.  
[201-12765]

## KINETICS AND MECHANISM OF SODIUM SULFIDE OXIDATION WITH MOLECULAR OXYGEN IN PRESENCE OF COPPER CONTAINING ION EXCHANGE RESIN KB-4

Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA: KHIMIYA in Russian Vol 25, No 1, Jan-Feb 84 (manuscript received 24 Dec 82) pp 85-88

FUNG TI SHI, ASTANINA, A. N. and RUDENKO, A. P., Department of Petroleum Chemistry and Organic Catalysis

[Abstract] Oxidation of sodium sulfide is an interesting problem in connection with the development and optimization of new methods for purification of natural and industrial waste gases. The goal of the present study was to investigate the kinetics and mechanism of action of copper containing ion exchange resins Cu(II)/KB-4 in sodium sulfide oxidation process with molecular oxygen (at atmospheric pressure) in aqueous solution at 20-60°C. The following stages of this process should be identified: 1) diffusion of  $S^{2-}$ ,  $HS^-$ ,  $H_2O$ ,  $O_2$  from the reaction solution towards the coordination centers on the surface of Cu/KB<sub>4</sub>; 2) chemisorption of  $S^{2-}$ ,  $HS^-$ ,  $H_2S$  on these centers with formation of surface copper sulfides; 3) oxidation of copper sulfides with molecular oxygen to copper hydroxide and elemental sulfur; and 4) oxidation of elemental sulfur. The oxidation rate did not depend on the concentration of copper in the phase of ion exchange resin. Figure 1; references 4 (Russian).

[199-7813]

ROLE OF POLYMOLECULAR PROCESSES IN DEVELOPING ZINC-ZEOLITE CATALYSTS FOR FORMATION OF  $\alpha$ -METHYLSTYRENE DURING CONVERSION OF CUMENE

Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA: KHIMIYA in Russian Vol 25, No 1, Jan-Feb 84 (manuscript received 18 Aug 82) pp 88-94

KAO KHYU TUAN, NGO TKHI TKHUAN, RUDENKO, A. P. and TOPCHIEVA, K. V., Department of Petroleum Chemistry and Organic Catalysis

[Abstract] In an earlier study an effect was noted during processing of zinc-zeolite catalysts used in formation of styrene from ethylbenzene during conversion of the latter. The catalyst was affected due to the formation and accumulation of condensation products (CP) of ethylbenzene on its surface. It was of interest to study conversions of cumene on the same catalyst under identical conditions. Except for a few characteristic differences (greater yield of gaseous products, somewhat lower yield of  $\alpha$ -methylstyrene) both processes appeared to be analogous. Figures 3; references 6 (Russian).

[199-7813]

TREATMENT OF  $\text{Fe}_2\text{O}_3/\text{SiO}_2$  CATALYSTS DURING POLYCONDENSATION OF CARBON MONOXIDE-HYDROGEN MIXTURES

Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA: KHIMIYA in Russian Vol 25, No 1, Jan-Feb 84 (manuscript received 16 Dec 82) pp 94-98

SAVEL'YEV, V. S., KULAKOVA, I. I., RUDENKO, A. P., OGLOBLINA, A. I. and FLOROVSKAYA, V. N., Department of Petroleum Chemistry and Organic Catalysts

[Abstract] Polycondensation of carbon monoxide with hydrogen on  $\text{Fe}_2\text{O}_3/\text{SiO}_2$  catalyst was studied varying the size of  $\text{Fe}_2\text{O}_3$  particles. During this process the following products were found:  $\text{CH}_4$ ,  $\text{C}_2\text{H}_4$ ,  $\text{C}_2\text{H}_6$ ,  $\text{CO}_2$ ,  $\text{H}_2\text{O}$  and various condensation products (CP). It was shown that the Buduar reaction and condensation of CO with  $\text{H}_2$  on  $\text{Fe}_2\text{O}_3$  catalysts occur as linked processes and that polycondensation accelerates the Buduar reaction. The CP forming on the surface of the catalyst contained considerable quantities of condensed aromatic hydrocarbons. The activity and selectivity of the catalysts were found to be dependent on the size of  $\text{Fe}_2\text{O}_3$  particles. Figures 3; references 7 Russian. [199-7813]

## CATALYTIC CONVERSION OF 3-ALKOXYTHIOLAN-1,1,-DIOXIDES IN PRESENCE OF HYDROGEN

Moscow KINETIKA I KATALIZ in Russian Vol 25, No 1, Jan-Feb 84 (manuscript received 13 Jul 82) pp 56-61

BEZMENOVA, T. E., MASHKINA, A. V. and YAKOVLEVA, V. N., Petrochemistry Sector, Institute of Physical-Organic Chemistry and Coal Chemistry, UkSSR Academy of Sciences, Kiev; Institute of Catalysis, Siberian Department, USSR Academy of Sciences, Novosibirsk

[Abstract] 3-Alkoxythiolane-1,1-dioxides (I) are obtained by addition of aliphatic alcohols to 3-thiolene-1,1-dioxide. In presence of catalytic amounts of bases these compounds could split a molecule of alcohol in a reversible reaction yielding 2-thiolene-1,1-dioxide. To shift the equilibrium to the right, the reaction should be carried out in an atmosphere of hydrogen and in presence of hydrogenating catalyst so that 2-thiolene-1,1-dioxide (II) would be converted to thiolan-1,1-dioxide. The goal of this study was to verify this reaction chain. Indeed, this was proven to occur, the end product forming in 100% when the reaction was carried out in aqueous-alkali solution. The kinetics of this reaction was investigated in detail. The reaction occurs through elimination of alcohol from I and continuous reduction of II forming in the process. Figures 3; references 5: 3 Russian, 2 Western (1 by Russian authors). [230-7813]

## REPLACEMENT OF SURFACE NITROGEN DURING SYNTHESIS OF AMMONIA OVER INDUSTRIAL CATALYST

Moscow KINETIKA I KATALIZ in Russian Vol 25, No 1, Jan-Feb 84 (manuscript received 6 Jul 82) pp 112-115

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[Abstract] The question was examined whether a reaction in a heterogeneous catalysis system occurs over the entire surface of the catalyst or over only a small portion. Ammonia was synthesized from nitrogen with natural isotopic composition, with a preliminary adsorption of  $^{15}\text{N}$  enriched nitrogen on the catalyst. Comparison of the rate of synthesis of ammonia with the exchange rate of the surface  $^{15}\text{N}$  nitrogen by  $^{14}\text{N}$  isotope from the gaseous nitrogen would give an indication of the equivalence of surface nitrogen in the synthesis of ammonia. Experimental results showed complete equivalence of the adsorbed nitrogen, most of its atoms transferring over to the ammonia formed in the reaction. Figure 1; references 3 (Russian).  
[230-7813]

## ISOTOPE EXCHANGE OF NITROGEN AND SYNTHESIS OF AMMONIA OVER URANIUM NITRIDE

Moscow KINETIKA I KATALIZ in Russian Vol 25, No 1, Jan-Feb 84 (manuscript received 6 Sep 82) pp 123-129

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[Abstract] Catalytic properties of uranium nitride were studied along with an attempt to determine the regularity of the activation of molecular nitrogen on metal nitrides of the second and third groups of the periodic system. Catalytic properties of uranium nitride samples with different chemical composition were compared ( $\alpha\text{-U}_2\text{N}_3$  and  $\text{UN}_{1.7}$ ), showing that in both cases the isotope exchange occurred by reverse dissociative adsorption of nitrogen. Because of a 12.0 kJ/mole difference in heat of adsorption of nitrogen on these catalysts, their catalytic properties were different. It was shown that the rate of nitrogen exchange was a reliable characteristic of the activation of molecular nitrogen and its ability to react with hydrogen. This variability of uranium nitrides in respect to the activation of molecular nitrogen is the cause for the divergence in the results obtained in previous syntheses of ammonia. Figures 4; references 17: 11 Russian (1 by Western author), 6 Western (1 by Russian authors).  
[230-7813]

# CO<sub>2</sub>, H<sub>2</sub> AND O<sub>2</sub> CHEMOSORPTION ON COPPER-ZINC-ALUMINUM OXIDE CATALYST FOR SYNTHESIS OF METHANOL

Moscow KINETIKA I KATALIZ in Russian Vol 25, No 1, Jan-Feb 84 (manuscript received 6 Aug 82) pp 159-165

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[Abstract] Cu-Zn-Al oxide catalysts are used widely in synthesis of methanol and in conversion of CO<sub>2</sub> with water vapor. On such catalysts, surfaces with different chemical nature are possible. The task of the study was to determine the surface area on which methanol synthesis occurs and to compare it with total surface area. To achieve this, the authors determined physical adsorption, chemisorption and heat effects during chemisorption of H<sub>2</sub> (20 and 50°), CO<sub>2</sub> (50°) and O<sub>2</sub> (20°). The heats of chemisorption, their isotherms and rates indicated that the surface was uniform. The total surface area was determined from the adsorption of krypton at liquid nitrogen temperature, the surface of the catalyst participating in the synthesis of MeOH was determined by monolayer adsorption of H<sub>2</sub> and CO<sub>2</sub>, and the adsorption of O<sub>2</sub> determined the surface of copper in the catalyst. Analysis of the data showed that 10% of the surface catalyzed the methanol reaction; copper accounted for 60% of the surface of Cu-Zn-Al catalyst and the rest was assigned to the aluminum oxide surface. Figures 2; references 21: 12 Russian, 9 Western (3 by Russian authors). [230-7813]

# EFFECT OF Ni-Mo COMPONENTS CONTENT IN HYDROPURIFICATION CATALYSTS ON THEIR ACTIVITY AND REACTION WITH ALUMINUM OXIDE CARRIER

Moscow KINETIKA I KATALIZ in Russian Vol 25, No 1, Jan-Feb 84 (manuscript received 19 Jul 82) pp 178-183

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[Abstract] The goal of this study was to identify oxide structures formed by Ni-Mo components during different syntheses of Al-Ni-Mo systems (ANM) and their effect on catalytic performance during hydrodesulfurization reactions. The catalysts were prepared by depositing Ni-Mo components from the salts Ni(NO<sub>3</sub>)<sub>2</sub>·6 H<sub>2</sub>O and (NH<sub>4</sub>)<sub>6</sub>Mo<sub>7</sub>O<sub>24</sub>·4 H<sub>2</sub>O over Al<sub>2</sub>O<sub>3</sub> by mixing, digestion or coprecipitation. It was found that NiO (3-4%) and MoO<sub>3</sub> (12-14%) react with the carrier during heating to 823 K forming solid solutions. Increased content of these components and increased temperature led to formation of NiMoO<sub>4</sub>, Al<sub>2</sub>(MoO<sub>4</sub>)<sub>3</sub> and even NiAl<sub>2</sub>O<sub>4</sub> phases. It was concluded that two active centers exist in these catalysts: the first type forming after sulfidation of the



phases, and the second type forming by  $\text{Al}_2\text{O}_3$  with various impurities and active components leading to solid solutions in the matrix of aluminum oxide. The surface density and energy of the active centers appeared to be identical in both cases. Figures 2; references 11: 8 Russian (2 by Western authors), 3 Western. [230-7813]

UDC 542.973.2

#### FORMATION OF POROUS STRUCTURE OF BISMUTH-MOLYBDENUM OXIDE CATALYST DEPOSITED ON SILICA GEL

Moscow KINETIKA I KATALIZ in Russian Vol 25, No 1, Jan-Feb 84 (manuscript received 22 Oct 82) pp 213-217

MIKHAYLENKO, Ye. L. and TARASOVA, D. V., Institute of Catalysis, Siberian Department, USSR Academy of Sciences, Novosibirsk

[Abstract] The formation of porous structures of  $\text{Bi}_2\text{O}_3 \cdot 3\text{MoO}_3/\text{SiO}_2$  catalysts was studied as a function of the relationship of active component/carrier to the treatment temperature. The Bi-Mo catalyst was calcined at  $350-650^\circ$ . With temperature increase a sharp drop in its surface was noted from  $8.4 \text{ m}^2/\text{g}$  at  $350^\circ$  to  $0.05 \text{ m}^2/\text{g}$  at  $650^\circ$ , along with increased bulk weight, decreased pore volume and greatly increased pore radius. When deposited on  $\text{SiO}_2$ , the catalyst showed similar effect of calcination on its surface and pore radius; however the bulk weight and pore volume remained unchanged. This was shown to be due to  $\text{SiO}_2$  transfer process through easily molten phase of Bi-Mo oxides. Silica gel clinkering did not appear to be related to the quantity of the active component, depending only on the treatment temperature. Possible mechanism of the distribution of Bi-Mo in the porous space of the carrier was proposed. Figures 3; references 12: 7 Russian, 5 Western (1 by Russian authors). [230-7813]

UDC 66.097.322.002.237:661.961.622

#### INDUSTRIAL TESTING OF METHANE CONVERSION CATALYST GS-12

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 2, Feb 84 p 78

MIKHALEVA, E.F., POPOVA, A.P., RAYKOV, B.S., BLOKH, B.M., YEGEUBAYEV, S.Kh., VESELOVSKIY, K.B., VINTSKOVSKAYA, A.T., MORGUNOVA, Ye.T. and KUSHNAREV, V.P.

[Abstract] The nickel catalyst GIAP-3-6N that is normally used for steam-oxygen conversion of methane (natural gas) at atmospheric pressure was found to be unsatisfactory at the Severodonetz Production Association "Azot" due to the high content of sulfur compounds in the natural gas (exceeding the norm 10-15 times), causing frequent shut-downs, catalyst attritions, and a drop in productivity. The problem was corrected by adding oxides of barium,

calcium and titanium to previously developed GS-12 catalyst. This catalyst was tested by converting a natural gas containing 200-350 mg/m<sup>3</sup> of sulfur compounds and was found to be more efficient than GIAP-3-6N, having a better physical structure, high rigidity and thermal stability, greater activity and high resistance to poisoning by sulfur compounds. Reference 1 (Russian). [204-12765]

UDC 66.095.264.097.322

#### SELECTING CATALYST CARRIER FOR OLEFIN DIMERIZATION AND CODIMERIZATION PROCESSES

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 2, Feb 84 pp 79-80

TIMOFEYEV, A.V., SHUMOVSKIY, V.G., ROMANCHENKO, L.Ya., MIN'KO T.G. and ANSHELES, V.R.

[Abstract] Hexene-based polyolefins have recently become more desirable owing to their valuable properties. One method for preparing hexenes, catalytic dimerization of propylene, is subject to cis- and trans-isomerization of the end product. Alkali metals are effective catalysts for propylene dimerization to 4-methylpentene-1 although potassium and lithium are hazardous to use. Sodium is effective but the gamma-alumina carrier used with it causes isomerization. The purpose of the present work was to select an industrially-available catalyst carrier that is not an isomerizing agent. Alumina-silica cracking spherules and silica gel spherules produced at the Salavat Chemical Combine were impregnated with potash solutions and heat treated. Test runs showed that potash-treated alumina-silica and silica gel are effective carriers for metallic sodium and are suitable as catalysts for production of 4-methylpentene-1. References 12: 6 Russian, 6 Western. [204-12765]

UDC 66.097.322.002.237

#### PASSIVATION OF NICKEL CATALYSTS

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 2, Feb 84 pp 94-97

CHESNOKOVA, R.V., BONDAREVA, A.A., BYKOV, V.G., ALEKSEYEV, A.M., BEREZINA, Yu. I., SYCHKOVA, L.A., SMUSHKOV, I.T., TESLENKO, V.M., KAN, A.S. and RYLOV, A.A.

[Abstract] A pressing problem in large scale ammonia production is rapid passivation of pyrophoric catalysts (rendering them non-ignitable in air) during accidental shut-downs and while changing spent catalyst charges. Nickel-chromia catalysts are currently passivated during production by gradually increasing the oxygen content in a nitrogen stream from 0.1 to 21% by volume in 80 to 100 hours at 25° - 40°C, which is too long a period for changing spent catalysts. In a previous work it was shown that nickel methanation

catalysts can be passivated in a much shorter time at 250°C after preliminary reduction and degasification. In the present work, pilot plant tests of experimental batches of reduced and passivated nickel methanation catalysts confirmed laboratory studies on passivation and reactivation and showed that the passivation time can be greatly reduced. Figures 4; references 16: 10 Russian, 6 Western.  
[204-12765]

UDC 661.961.5:66.097.322

INFLUENCE OF ACID AND ALKALINE IMPURITIES ON ACTIVITY OF LOW TEMPERATURE  
CARBON MONOXIDE CONVERSION CATALYST

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 2, Feb 84 pp 97-98

SUKHORUCHKINA, L.A. and SEMENOVA, T.A.

[Abstract] A study was made of the relationship of the activity of a low temperature carbon monoxide conversion catalyst to the presence of acid and alkaline type impurities originating in the catalyst raw material. Analysis of the data collected by a previously described method shows that the presence of chloride and sulfate ions accelerate the deactivation of low temperature catalyst. The action of these ions cannot be fully compensated by addition of alkalis. Chloride ion is the strongest and most dangerous catalyst deactivator. References 5: 3 Russian, 2 Western.  
[204-12765]

## CHEMICAL INDUSTRY

### CHEMISTRY MINISTER SUMMARIZES FIRST-QUARTER PRODUCTION

Moscow EKONOMICHESKAYA GAZETA in Russian No 19, May 84 pp 1, 8

[Article by USSR Minister of Chemical Industry V. V. Listov: "Intensification of Big Chemistry"]

[Text] Chemicalization is an important, inseparable part of intensifying industrial and agricultural production. Use of chemical products and processes significantly raises labor productivity, saves material resources and improves the technical level and consumer properties of articles.

One of the basic sectors of industry, chemical industry is called upon to effectively influence the rate and scale of scientific-technical progress in the national economy during the 11th Five-Year Plan. In accordance with the assignments of the five-year plan, production of high-quality polymers with prescribed technical characteristics (including reinforced and filled plastics) and production of plastic tubing are developing in the Ministry of Chemical Industry.

Special attention is being devoted to fuller satisfaction of the economy's demand for various polymer additives, auxiliary compounds used in textile industry, preservatives, catalysts, synthetic fibers, filaments and dyes, paints, varnishes and packaging materials, detergents and other products. The goal of maximally replacing natural fibers, fats and vegetable oils used for industrial purposes by synthetic products has been posed.

In accordance with the plan for 1984, production of synthetic resins and plastics is being increased by 11.8 percent, and it will exceed 4.9 million tons. New major output capacities will become operational in the Mogilev Khimvolokno and Kemerovo Karbolit associations, at the Rustavi Chemical Fiber Plant and a number of other enterprises.

The laborers of chemical industry face important tasks in 1984 associated with improving the use of production capacities, reinforcing the discipline of deliveries and hastening introduction of the achievements of science and technology into practice. The sector has initiated a competition among labor collectives for full satisfaction of contracted obligations and for all-out growth in production effectiveness.

Erection of the largest methanol production complex at the Tomsk Chemical Plant (see photograph [photograph not reproduced]) was completed in early 1984. Congratulating the participants of the construction project with their labor victory, the CPSU Central Committee noted that commissioning of this modern enterprise is a significant contribution to development of the country's chemical industry.

The work of the sector in 1984 is described by USSR Minister of Chemical Industry V. V. Listov in the article below.

Chemicalization is commonly recognized to be a powerful factor contributing to intensification of industrial and agricultural production. Each ton of polyethylene used in place of traditional materials provides the national economy a savings of almost 1,900 rubles, while polypropylene provides a savings of 5,000 rubles. Chemical products are unique catalysts of scientific-technical progress in all sectors.

The workers of the country's chemical industry received the decisions of the April Plenum of the CPSU Central Committee and the premises and conclusions contained in the speech by Comrade K. U. Chernenko as a task of enormous political and economic significance. The work days of the collectives of all of the country's enterprises and institutions are infused with a concern for unconditional fulfillment of planned quotas and socialist pledges, and for deepening production intensification.

The plan for 1984 foresees increasing the sales of chemical products within the Ministry of Chemical Industry by 3.5 percent, raising labor productivity by 3.7 percent and achieving a growth of 8 percent in profits. The sector is called upon to promote more-effective development of the entire national economy and to make a tangible contribution to implementing the food and energy programs.

The collective of the Ministry of Chemical Industry has taken an active part in the movement for surpassing the quota for growth in labor productivity by not less than 1 percent and reducing product cost by half a percent. There are many examples in which higher pledges have been adopted. Moreover the work results of the first quarter show that the overwhelming majority of the competitors are fulfilling their patriotic duty with honor.

In comparison with the same period of last year, labor productivity exceeded the planned indicator by more than a percent in the first quarter within the

sector as a whole. The additional decline in product cost was over half a percent.

Production was higher than planned in January-March for chemical fibers and filaments, synthetic resins and plastics, caustic soda and soda ash, consumer goods and other products, for a total of 86 million rubles. The sector is gradually coming closer to compensating for the shortfall that occurred at the beginning of the five-year plan and to starting 1985 with a good head start.

Let me mention one important detail: Last year chemists fulfilled their plan for the first time in several years. It is especially important for us to make this good trend stable and irreversible. In this connection we can distinguish three main directions in which the sector's labor collectives are concentrating their efforts. I am referring to full satisfaction of the annual plan in terms of product assortment and delivery contracts, improvement of the use of production capacities and acceleration of scientific-technical progress.

In comparison with January-March of last year, sales rose from 93 to 97.7 percent, with a consideration for contracts. Today we are not so much pleased by this increment of a little over 4 percent, as we are concerned by the lacking 2.3 percent.

The list of chemical products is extremely vast, containing over 50,000 names. This fact served for a long time as a justification whenever the question of delivery shortfalls arose among certain negligent enterprise and association executives. The governing board of the Ministry of Chemical Industry has assumed a principled position, condemning the worthless practice of a number of all-union production associations that follow the old practice of awarding victory in competition to enterprises which surpass the production plan "in general" but which fail in production of specific products and let consumers down.

The results of the first quarter show that certain advances have been made in strengthening delivery discipline. The number of enterprises failing to fulfill the product mix plan has dropped dramatically.

Production of cultural, personal and household goods at enterprises of the Ministry of Chemical Industry has increased from 100 percent in 1980 to 107.7 percent in 1981, 112.1 percent in 1982 and 120.6 percent in 1983, with a figure of 127.7 percent planned for 1984.

The experience of the true leaders shows that efficient planning, close business contacts with associates and maintenance of the necessary reserves of raw materials make it possible to insure fulfillment of all aspects of the plan and fully satisfy each consumer without seeking excuses in objective causes. This is precisely the way things are going at the Novopolotsk Polimir Association. Many other associations are also operating stably--for example Khimvolokno in Kiev and Stekloplastik in Severodonetsk.

Another favorite tactic--citing the unsatisfactory work of transportation--is also usually found to be groundless upon inspection. There can be no debate

that sometimes railroaders and truckers let the sector's enterprises down when it comes to carrying their products. But this cannot serve as a justification for internal mismanagement. This was recently confirmed by the governing board of the Ministry of Chemical Industry, which discussed the work experience of the Dnepropetrovsk Paint and Varnish Plant and the Novopolotsk Polimir Association in regard to effective use of rolling stock.

These organizations managed to sharply reduce rail car idleness without bringing in additional resources, simply by implementing internal measures to improve warehousing, organizing freight-handling operations and achieving coordination with shippers. All products are dispatched to consumers promptly and in full volume.

Specific questions concerned with strengthening delivery discipline and analysis of the activities of the leading and trailing enterprises are now enjoying increasingly more emphasis in the agenda of the governing board of the Ministry of Chemical Industry.

The 1984 plan foresees improving the use of existing output capacities and hastening assimilation of new capacities. The results of the first quarter indicate that positive changes have also occurred in this direction of the sector's activities.

As we know, the December (1983) CPSU Central Committee Plenum levied serious criticism at us for not utilizing our output capacities to the fullest. The governing board of the Ministry of Chemical Industry made the most serious conclusions from this.

Over half of the capital investments of this year are oriented on reconstruction and reequipment of existing enterprises. Specific goals have been assigned to each collective to insure maximum loading of the equipment. When it comes to new construction projects, special attention is being devoted this year to commissioning facilities providing raw materials to production of the most important chemical products. This will make it possible to eliminate the disproportions existing within the sector by the end of the five-year plan.

The Shchekin method of increasing production with the smallest number of workers came into being some time ago within the Ministry of Chemical Industry, and it has enjoyed wide support not only in the sector but also in the national economy. Owing to this, 70,000 persons have been freed by enterprises of the Ministry of Chemical Industry in the last 15 years. A possibility arose for providing highly qualified workers to new production facilities.

Our sector is unique in that most production processes are continuous, and they must proceed under strictly determined conditions. Machine units and apparatus characterized by enormous unit output capacity are used primarily. This is why stable collectives in which the spirit of mutual aid, creative enquiry and growth in qualifications are well developed are so important to us. We can find all of this in brigades, the absolute and relative numbers of which are constantly increasing. Over half of the workers of chemical industry are now working in brigades.

Improvement of the use of output capacities is inseparably associated with raising economy and with making sensible use of fuel, power, raw materials and other material resources. Unfortunately, there are still many shortcomings in this effort. The nonrhythmical work of certain enterprises and violations of production procedures are resulting in overexpenditure of raw materials and other materials. Cases of outright mismanagement have not been completely eradicated.

Executives of the Shevchenko Plastics Plant used a shortage of benzene as the explanation for their failure to fulfill the planned quotas for production of styrene and polystyrene. And yet the enterprise did possess a facility for its production, while wastes that could serve as raw material from which to obtain benzene were simply burned away. Naturally, those guilty of such stupid bungling were severely punished.

Great reserves can be found in recycling of heat liberated in the course of production processes and in reduction of losses arising in the course of production and product storage. The possibilities are many in number. But economy is becoming a necessity as business undergoes intensification. The feasibility of our plans and pledges depends in many ways on sensible expenditure of resources.

Vegetable oils are used in the production of paints and varnishes. A large quantity of cotton fabric is used for industrial purposes. Scientists and producers have found ways to substitute these natural materials by synthetic ones. Since the beginning of the five-year plan the sector has reduced its consumption of cotton fabric by 23.8 million linear meters, and 96,000 tons of vegetable oils and other edible raw materials have been rerouted into dietary uses in the sector. We intend to do the same thing in other sectors as well.

Our scientists are productively working to see that chemical filaments and fibers would surpass natural ones not only in physicochemical parameters but also in hygienic properties. Much has already been done.

Discoveries made by scientists of our leading Scientific Research Institute of Physical Chemistry imeni L. Ya. Karpov have enjoyed world recognition. In the last few years this institute created about 150 new ferrielectric and seignette-magnetic compounds.

Membrane filters developed by the Plastmassy Scientific-Production Association are being used in many processes of chemical, pulp-and-paper, leather and food industry. Polymer membranes solve the problems of concentration, separation, purification and sterilization of solutions and gases in an entirely new way.

According to data from the USSR Ministry of Meat and Dairy Industry use of ultrafine filtration membranes in the production of soft cheeses increases the yield of the finished product by 8-10 percent. Using them to process just a third of the products produced by the country will provide a possibility for saving up to 25,000 tons of milk per year and for producing over 3,000 tons



of additional products. The cottage cheese yield increases by 15-20 percent when such membranes are employed.

The main goal of scientific enquiry remains improvement and creation of fundamentally new production processes (electrochemical, plasmochemical, membrane, photochemical, biochemical, radiation, laser, shock wave, catalytical and so on). All of them are becoming the base for the sector's reequipment and for a new phase in the national economy's chemicalization.

With the help of science, chemical production is becoming not the enemy but the friend and protector of the environment. Wasteless production procedures that are now being introduced into our enterprises and closed recycled water systems make it possible to conduct all processes with practically no influence upon nature. In the last five years, for example, the production volume of the Ministry of Chemical Industry increased by about 30 percent with no increase in water consumption.

Chemical products are used extensively in water treatment facilities, and they protect the air and water basin from harmful exhausts. However, a number of the sector's old enterprises still require improvements in nature conservation facilities. The Ministry of Chemical Industry is keeping these issues under unweakening control.

A dissatisfaction with present achievements and a businesslike mood can be sensed today in every labor collective. It is important to consolidate and develop the positive changes that have occurred in the sector's work. This will require us to put reserves into action at every enterprise and at every work station. Only in this way will we be sure that pledges adopted for the 4th year of the five-year plan would be satisfied.

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CSO: 1841/240

## MODERNIZATION OF TEXTILE INDUSTRY PLANNED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 28 Apr 84 p 2

[Article by V. Smirnov, deputy minister of the chemical industry, in the column "Quality---A Total Task": "Correction for Demand"]

[Text] At the end of last year several alarming telegrams came one after another from textile enterprises to the Ministry of the Chemical Industry. They categorically refused several kinds of production of the Kaunas, Sokal and Zhitomir chemical fiber plants. And they named the reasons which impelled them to do this: the quality of acetate, polyamide and polyester filaments and also kapron complex and viscose fibers and filaments does not satisfy today's requirements. Light industry now needs raw materials which would enable dress and raincoat fabrics to be obtained which do not differ from natural. Also requirements for a selection of colors have become stricter. Naturally, we remembered at once as an example the same grievances of light industry workers to the chemists of Engels, Serpukhov and Fergana.

We in the Ministry studied the interaction experience of the branch with suppliers. We held a joint meeting of colleagues of the Ministry of the Chemical Industry and the Presidium of the Central Committee of the Trade Union of the Chemical and Petrochemical Industry, when questions relating to these problems were discussed. First of all, the experience of genuinely conscientious partnership was generalized. The Mogilev Khimvolokno Production Association, for example, rapidly has begun to come out of a long break. This collective has restored its fruitful connections with suppliers--specialists of the local silk combine. They jointly developed a specific long-term program for output of quality polyester filaments.

In the course of the investigations, it was explained that it is possible to produce a newer, more contemporary assortment of silk and staple fabrics based on these filaments. There are already experimental samples, and now specialists and workers of both Mogilev enterprises are actively included in the work, which enables production of fabrics to begin on a level with the best world samples.

One can place in this rank the Novopolotsk Polimer Production Association, which produces an excellent Nitron fiber, the Daugavpils Khimvolokno Production Association, which supplies kapron and textile filaments, and the Kursk Khimvolokno Production Association, the polyester fiber of which also enjoys great demand.

Does this mean that we can do good work? We can. It became more strategic to introduce an advanced worker experiment.

And just the same, the rejection of the production of a whole series of chemical enterprises worried the ministry specialists. Impartial analysis showed that formerly we, speaking simply, overlooked the long-term and seriously lagged in the technical retooling of many enterprises. It was well-known, for example, that the Klin and Engels Khimvolokno Production Associations, and also the Rubezhnoye Krasitel' Scientific Production Association, the Berezniki Chemical Plant and a number of others are in need of renovation. And the research institutes of the branch have lagged in improving highly efficient processes and developing principally new equipment on this basis--primarily for reconstruction. Insufficiently close creative connections with our production requirements show up.

It was necessary to make serious conclusions and to focus the forces of scientists and specialists on the decisive parts of technical renovation.

We examined the grievances of the textile enterprises about the color selection jointly with specialists of both branches and planned a number of specific measures. First of all, we provided for the mass production of those dyes which have already been developed in scientific laboratories.

In September of this year fully mechanized and automated production of dispersed dyes will be put into operation at the Tambov Pigment Association. With time, chemists will supply customers, and also more than 30 kinds of tints to the enterprises of their own branch. The largest production of dyes for natural leathers in this country will go into production this year. In consideration of the fact that this is now "marketable goods," it is possible to say with assurance that the use of new classes of dyes for leather provides for a considerable enlargement not only of the selection of shoes but also a whole range of fancy leather goods.

The production of active vat and dispersed dyes was established at the Ivano-Frankovsk Fine Organic Synthesis Plant and at the Rubezhnoye Krasitel' Scientific Production Association. But it must be admitted that the work is still poor.

The Rubezhnoye workers, for example, last year did not fulfill the plan for fifty varieties of production. The Berezniki Chemical Plant also did not send subcontractors almost half of the varieties of dyes, including that for jeans fabric. The directors of these enterprises, V. Grebenyuk and M. Urakov, the chief specialists, until now have not succeeded in bringing the proper order to production and are slowly strengthening the discipline of shipments.

Now, in the period of reorganization of enterprises, it is very important to provide the persons engaged in production with promising scientific developments. The branch institutes have begun to give them more help. They have improved considerably the work of the specialists of the Scientific Research Institute of Organic Intermediates and Dyes, who developed a new class of dyes, pigments and so-called cubogens--dyes of bright rich hues, experimental batches of which already have been produced at one of the branch enterprises.

They deserve the attention of the research of our scientists directed toward the use of the cellulose fiber Siblon. They began to produce it at the chemical fiber plant at Krasnoyarsk. A completely new assortment of children's fabrics has already been produced on a base of Siblon. This fiber according to a number of indicators, such as the hygienic properties and durability, approaches the best varieties of cotton. The use of Siblon not only will enable the new materials and products to be produced, but, what is also important, will raise labor productivity considerably at textile enterprises. We have already sent not less than 50,000 tons of such fibers to light industry this year.

The scale of the share of the chemical branch in the production of consumer goods is rather large. According to our calculations, in our country, articles are produced with the use of chemical materials at a sum of more than 110 billion rubles. Fibers and filaments produced by enterprises of the branch have found widest use in the wool and silk industry in the manufacture of knitted and nonwoven materials. In technical fabrics they considerably increase their mechanical strength and durability. And this means about 10,000 tons of natural fibers are saved. For a more objective representation it is sufficient to mention this fact: the share of chemical fibers and filaments of the total textile raw materials exceeds one-fourth.

The bonds connecting two ministries--the USSR Ministry of the Chemical Industry and the USSR Ministry of Light Industry--continue to be strengthened. Now we are thinking about establishing production of new types of fabric and knit linen with a decreased materials-intensity based on the use of low linear density chemical fibers. This is a completely new business, which requires from scientists and specialists the development of progressive technological processes. An agreement on a program for joint action of the two ministries on the establishment of modified chemical fibers and filaments, dyes and textile-auxiliary substances for light industry has been finalized for the next Five-Year Plan.

12410

CSO: 1841/231

## CYBERNETICS IN CHEMICAL TECHNOLOGY

Moscow KIBERNETIKA V KHIMICHESKOY TEKHNologii (NOVOYE V ZHIZNI, NAUKE, TEKHNIKE: SERIYA KHIMIYA) in Russian No 1, Jan 84 pp 2-10, 64

[Annotation, introduction and table of contents from monograph "Cybernetics in Chemical Technology" by Viktor Vyacheslavovich Kafarov, member of the USSR Academy of Sciences, Znaniye, 26,810 copies, 64 pages]

[Text] Annotation

The application of methods of cybernetics in chemical technology makes it possible to optimize separate processes as well as technical systems as a whole. The use of cybernetic ideas of the observability and controllability of processes makes it possible to develop channels and methods of control and to project jointly both technological schemes of production and systems of controlling production. Methods of cybernetics provide the grounds for developing chemical production without waste.

This booklet is intended for readers interested in modern methods of mathematical modeling in chemical technology. It could be useful for lecturers, teachers and students at peoples' universities and students of chemical specialties.

### Introduction

In August 1983, the CPSU Central Committee and USSR Council of Ministers adopted the resolution "Measures to Accelerate Scientific-Technical Progress in the National Economy". Its main efforts are aimed at extensive automation of technological processes based on the application of automated systems and computer technology and the development of flexible automated production and systems of automated planning.

When speaking of technical progress of chemical, petrochemical and related sectors of industry, it should be noted that, at the present, they have an entire series of distinctive features, among which the most important are: 1) the development of machines of large unit capacity and 2) the reconstruction of operating enterprises with the goal of optimizing and completely automating technological processes and schemes. Today, only optimally-organized technological schemes and machines have the right to exist. In connection with this, principally new scientific and technical tasks, which

simply did not exist before, are arising for developers of technical schemes and machines. They are: guaranteeing production will operate in the most favorable system according to economical and energy-technological indicators; the transmission of control functions to production itself, that is, in production there must be "stingy automation", it cannot be hung with monitoring and testing equipment like a New Year's Tree is hung with toys. For this it is essential that the equipment and organizations of material flows in it are developed with dynamic properties assigned in advance. The machine or production must be cybernetically organized; the reliability of the machine's functioning must be strictly calculated and secured because if the machine shuts down, even if only for one hour, all of its advantages will be brought to nothing; the problem of developing waste-free production must be resolved; creating reserves of the subsequent reprocessing of products and their preservation (task for forecasting); guaranteeing high quality technological calculations and planning as a whole and guaranteeing proper quality of equipment preparation, which is possible only if there is a shift to automated planning.

\* \* \*

In 1834, the French physicist and mathematician A. Ampere wrote the book "Essais sur la philosophie des Sciences" in which each of the sciences known at that time was allotted its place. In a column under No 83, Ampere included the science of methods of controlling society. He named this science "Cybernetics", using the Greek word which was used in ancient times to signify sciences on maneuvering (steering) ships ("kybernētēs"--steering, feeding).

In 1948, the word "cybernetics" was used by Norbert Wiener, mathematics professor of the Massachusetts Institute of Technology in the book "Cybernetics, or Control and Communication Machines and Living Organisms", recognizing under cybernetics the science of general laws of processes of control and transmission of information in machines, living organisms and their union. The formation of cybernetics was caused, on one hand, by requirements of practice and the promoted task of developing complex units of automatic control, and, on the other hand, the development of scientific disciplines which study control processes in various physical and physical-chemical fields and which have primed the creation of the general theory of these processes. Among these sciences are: the theory of mathematical modeling, the theory of algorithms and optimization, the theory of automatic regulation and tracking systems, the theory of electronic program-controlled computers, the statistical theory of reprocessing and information transmission, the theory of plans and the acceptance of resolutions and the complex of sciences which study processes of control in living nature.

The outstanding physiologist, Academician Ivan Petrovich Pavlov, established foundations of control of living nature through so-called feedback, having developed the famous doctrine of conditioned reflexes. The brain of an animal reacts to external irritation by means of feedback, giving the "order" to react with corresponding organs (the pupil of the eye contracts in bright light and dilates with the onset of darkness, etc.).

Academician Pavlov wrote: "Man is, of course, a system (crudely speaking, a machine) and like every other one in nature, is subordinated by laws which are unavoidable and common for all of nature; but the system on the horizon of our modern scientific vision is unique with respect to its high self-regulation, and on its own the system supports, regenerates, repairs and even improves itself."

Later, N. Wiener and G. Neumann combined Pavlov's ideas with principles of the operation of computers. It was later determined that the structure of nervous circuits of man, composed of nerve cells (neurons), is analogous to the communication structure in control systems.

It turned out that the processes in these circuits and bonds are similar: the accumulation and reprocessing of information have a discrete nature, on the principle of "yes--no". Nerve cells, like triggers (fixing elements) of computers, are in only two states--they can be stimulated or not--like "switch on--switch off". Obviously, it is easier to build a computer which recognizes two states, than 10 (10 digits of the decimal system).

From here, the expediency immediately arises of using the binary system of numeration in both the evaluation of information and in the construction of computers. Only two digits are figured in this case: 1 and 0, and the entire calculation is conducted in different combinations of 1 and 0.

The shift from the decimal system of counting to the binary system is not difficult.

Simplicity of calculations and the simple use of mathematical logic are advantages of this system, since all algebraic variables can accept only the two numerical values 0 and 1. On the basis of the binary calculation principle, the English mathematician G. Boole (1815-1864) developed a very ideal mathematical-logical scheme (Boolean Algebra).

The concept of feedback [*in italics*] is an important concept of cybernetics as bases of automation in nature and technology. It is manifested in the influence, on the process, of its own action.

In closed systems, feedback can occur in two directions. If feedback reinforces the process, it is said to be a positive return communication (chain reactions, for example). If, on the other hand, the return action retards the process, it is said to be a negative feedback (burning of coal in a closed space, for example).

In technology, feedback is used to control a process. Here, the signal from a system's output yields to its input. An example could be a closed system of autoregulation with a negative feedback. The regulator continuously "follows" the output parameter of the regulated process and compares it with the assigned value. According to the difference observed in this comparison, the device corrects the valve position (the executive mechanism), which returns the value of the output characteristic to the sustained level.

Systems with feedback can be without delays or with delays (inertia systems). In the latter systems, changes in any values accumulated in them can appear not immediately, but after some time has passed. For example, emanation of heat can, with a delay, be reflected in the composition of the final product. For chemical systems (objects or parts), high inertness is characteristic--gradualness in the change of the output value while the change of the input value is rapid. Compensation for the delay and work with forecasting the behavior of the regulated process form a basic task of theory and practice of automatic control by chemical processes.

Complex phenomena, among which are many processes of chemical technology, are usually diverse in their inner communications and subjected to stochastic changes. Therefore, information on such processes can be expressed with the aid of statistical values.

In the case where the experiment can give  $N$  of different results, and  $n$  is favorable, then the probability of a favorable result is

$$P = \frac{n}{N} \cdot \quad (1)$$

According to expression (1), the probability is presented as a fraction. This has its inconveniences, since an examination of probability ratios leads to multi-level fractions. Therefore, when expressing a quantity of information which deals with probability ratios, it is convenient to interpolate logarithms of probabilities, thereby replacing multiplication and division of values with addition and subtraction of their logarithms. In 1848, Chenon proposed that in order to calculate the amount in the case of uneven probabilities, one can use an equation of entropy of information analogous to Bal'tsman's famous entropy formula:

$$i = -(P_1 \lg_2 P_1 + P_2 \lg_2 P_2 + \dots + P_m \lg_2 P_m) = -\sum_{j=1} P_j \lg_2 P_j. \quad (2)$$

Here, logarithms are begun on the base 2.

For the unit of information, a binary digit is taken, or a bit (from the English words binary digit), which uses with equal probability two different values (0 and 1), which is especially convenient for technical aims. This explains the choice of a binary system of counting instead of the decimal system we usually use.

Information in systems is transmitted as signals (electric, light, sound, radio signals, mechanical or thermal effect).

Signals are characterized by their direction of effect, that is, in a system consisting of a series of units, each unit is a signal source in relation to the subsequent unit, which, in this way, serves as a signal receiver and source for the next signal.

A signal is transmitted through a unit in this case only in one direction: the entering signal of the unit always remains a reason to change its operating



conditions, and the exiting signal--a consequence--and they cannot change places; in other words, the direction of effect cannot be reversed.

Depending on the nature of the signal change when entering the unit, the nature of the signal when exiting the unit also changes. Usually, when determining characteristics of the unit, the signal, upon entering, is supplied in three ways.

1. The input value (the indicator concentration in the system, for example) is changed gradually and the so-called output F-curve, or response curve, is received (graph 1,a).
2. The input value is instantly changed (delta function) and the so-called C-output curve is received (graph 1,b).
3. The input value is changed according to laws of harmonic scillation and at the output, the harmonic oscillation which has been changed in amplitude and phase is also received (graph 1,c) (frequency characteristics).

The principle of the "black box" [in italics]. In analyzing complex processes, when it is not possible to find inner bonds in the system, the "black box" principle is used. This principle consists of the fact that, not having information on the essence, or the inner structure of the process, only the dependence of output values on input values is used for its mathematical description.

The concept of the "black box" is related to the basic concept of cybernetics, helping to abstract, when studying the conduct of systems, from their inner structure. Many systems, especially large ones, turn out to be so complex, that, even having complete information on the condition of their elements, it is practically impossible to connect it to the system's operation as a whole. In similar cases, the presentation of such a complex system in the form of a sort of "black box", functioning similarly to the system, facilitates the construction of a simplified model. Analyzing the model's procedure and comparing it to the system's procedure, it is possible to make several conclusions about the properties of the system itself and when they coincide with properties of the model, to choose an effective hypothesis on the proposed structure of the investigated system.

A clarification of the "black box" is possible with a detailed study of the nature of input curves--response curves of the system. This makes it possible to determine the parameter change of the studied system with time, which is very important when investigating actual conditions of the functioning of chemical-technological processes. Such a cybernetic approach reveals the possibility of modeling complex processes and searching for parameter or coefficient values of developed mathematical models.

Both determined and stochastic conduct correspond simultaneously to processes of chemical technology. The determined component of processes is identified by fundamental laws of physical chemistry which, naturally, is also the basis of processes and devices of chemical technology in the classical sense. The

stochastic component by its nature reflects the instability of processes, which appears in the varied amount of time that different elements of substance remain (mass and energy currents) in the device's volume and lengthwise, and in the statistical distribution of part of the current along the trajectory and temporary parameters.

The determined component, on the basis of fundamental transfer laws of mass and energy, makes it possible to strictly theoretically determine the rate of the course of one or another process, and also, consequently, the kinetic time  $t_k$ , which is necessary to attain the final condition or completion of the process at a given rate. However, in industrial instruments, the actual completion time of the process  $t_n$  could also not correspond to the time  $t_k$ , which was received on the basis of kinetic laws, since  $t_n$  depends on conditions of the course of the process in the instrument, the nature of the distribution of currents in the instrument, their structure, which is directly connected with the instrument's construction, the external supply of energy, the presence in the instrument of interspersed units, negative closures, covers, hoods, the varied structure of currents of different phases in multiphase systems, etc. It is apparent that the calculation of processes results in the identification and comparison of  $t_k$  and  $t_n$ , whereupon the ratio  $t_n / t_k$  must always be maintained.

If the stochastic component is not considered, immediate transmission of results of experiments conducted on a laboratory scale to industrial objects is impossible.

Scientists of our nation have contributed greatly to the development of research methods used in cybernetics. Foundations of the theory of automatic regulation were laid by efforts of Professor D. A. Vyshnegradskiy (1831-1894); Academician A. M. Lyapunov (1857-1918) composed the theory of system stability and Academician A. I. Berg developed technical cybernetics in our country. Academician L. S. Pontryagin developed principles of the optimum state of systems (Pontryagin's maximum principle). Academician N. A. Kolmogorov worked out mathematical foundations of statistical and probable cybernetics systems.

In the 1960's, within the walls of the Moscow Chemical Technological Institute imeni D. I. Mendeleev, extensive expansion began and was produced, both here and abroad, of work in a new scientific direction--cybernetics of chemical-technical processes. The results of these efforts are widely employed in industry.

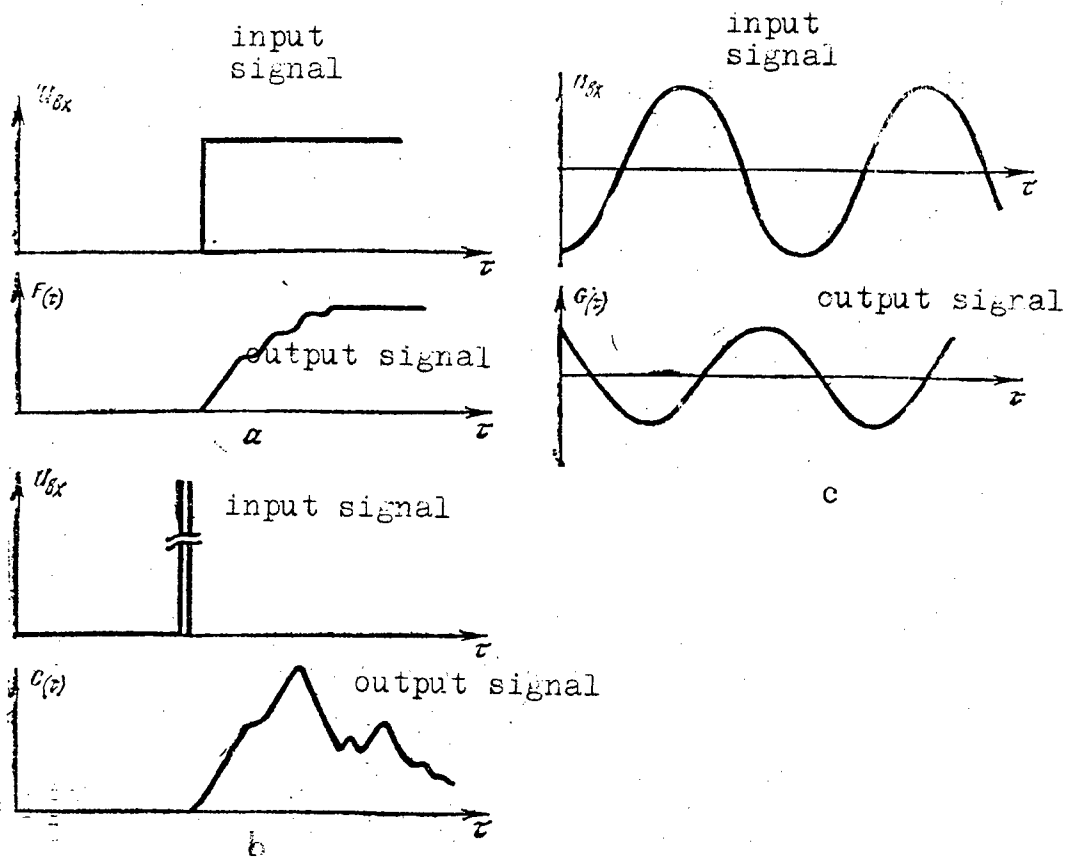


Figure 1. Types of input and output signals: a--gradual signal (F-curve); b--impulse signal (C-curve); c--harmonic signal (frequency characteristics).

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CSO: 1841/222

## PRODUCTION OF PHOSPHORIC ACID IN PROCESSES OF COMPLEX ACID-NITRATE TREATMENT OF APATITE CONCENTRATE

Kiev KHIMICHESKAYA TEKHNLOGIYA in Russian No 2, Mar-Apr 84 (manuscript received 13 Jun 83) pp 14-16

MULYARCHUK, I. F., GUMEN, V. I. and SIDAMASHVILI, Ts. A., Kiev State University

[Abstract] Experimental results were reported on the production of phosphoric acid in complex acid-nitrate treatment of apatite concentrate followed by extraction with tributylphosphate. Two variants were analyzed: in one--impurities (nitric acid, rare earth elements) were extracted from phosphoric acid, in the other--the phosphoric acid itself was extracted and purified. The second method gave purer phosphoric acid with a  $P_2O_5$  content of 29%, suitable for production of luminescent materials, food phosphates, etc. References 15: 12 Russian, 3 Western. [229-7813]

UDC [661.321+661.311].002.237

## OBTAINING SODA AND POTASH FROM SYLVINITE ORES OF KARLYUK DEPOSIT

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 2, Feb 84 pp 93-94

KRASHENINNIKOV, S.A., GREF, T.S. and MUINI, M.A.

[Abstract] Of the six major potassium salt deposits in Central Asia, the Karlyuk deposit (TaSSR) has the greatest industrial significance having over 5 billion tons reserves, with carnalite sylvinite as the predominant potassium ore. Since 1976 the All-Union Scientific-Research Institute of Hydrotechnology has been conducting underground leaching of sylvinite ore from this deposit to recover NaCl and KCl from the brine by evaporation. It has been proposed to convert the KCl into potassium sulfate or metaphosphate, although this requires high energy and sulfuric and phosphoric acids which are both in short supply. In the present work it is proposed instead to work the brine into soda and potash by the Solvay Process. Both of these products can be used in Central Asia, i.e., soda in the glass industry and potash as fertilizer for cotton. Some results are presented of a study on the preparation of soda and potash from brines obtained from the Karlyuk deposit. References 7 (Russian). [204-12765]

## ANALYSIS OF LEVEL OF CONCENTRATION AND ITS EFFECT ON TECHNICAL-ECONOMIC INDICATORS OF WORK AT NITROGEN INDUSTRY ENTERPRISES

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 2, Feb 84 pp 120-123

TRISHECHKIN, A.I.

[Abstract] The organizational forms of social production are related to the division and dissemination of labor as manifested in concentration, specialization, cooperation and combination, the problem of concentration as a factor for increasing the effectiveness of social production being very pressing at the present time. The effectiveness of concentration in the nitrogen industry, as based on recorded data of 1977 is analyzed by groupings according to volume of gross production, cost of industrial fixed capital and size of industrial work force. Other methods such as Lawrence graph and Jeni-Herfindel's index are also used to show the growth of concentration in enterprises of the All-Union Association "Soyuzazot". A tendency towards a disproportionate drop in outlay with consolidation of production is observed. Figures 5; references 2: Russian.  
[204-12765]

UDC: 547.491.4

## INTERPHASE CATALYSIS BY QUATERNARY AMMONIUM SALTS IN CURTIUS REACTION

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHOLOGIYA in Russian Vol 27, No 2, Feb 84 (manuscript received 15 Jul 82) pp 169-171

ZLOBIN, V. A., KOSOLAPOV, V. T. and TARASOV, A.K., Department of Chemistry and Technology of Organic Nitrogen Compounds, Kuybyshev Polytechnical Institute

[Abstract] A study is made of interphase catalysis of the reaction between benzoyl chloride and sodium azide in o-xylene, catalyzed by quaternary ammonium halides. The reaction is usually performed in a medium of nonpolar solvents which do not mix with water. Sodium azide is poorly soluble in these solvents, and, as a result its interaction with the chlorides, is heterogeneous and quite slow. Interphase catalysis with quaternary ammonium salts has been successfully used to accelerate the reactions of a number of acyl chlorides with sodium azide in a liquid-liquid system. This report presents results of a study of the influence of quaternary ammonium salts on the reaction rate of benzoyl chloride with sodium azide in o-xylene. The reaction was performed at 140°C, chloride concentration 0.144 mol/l. Data were obtained on the influence of ammonium halides on the duration of the reaction. The data indicated that the effectiveness of the additives increased from iodides to chlorides. The large quaternary ions are soft and

therefore have a tendency to form ion pairs with the softest anions present in the solution. Figure 1; references 6: 3 Russian, 3 Western.  
[221-6508]

UDC 66.061.3/.5:547.871

INDUSTRIAL TESTING OF CONTINUOUS BENZENE EXTRACTION OF TRIOXANE

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 3, Mar 84 pp 170-172

FANDEYEV, M.A., PAVLIKOV, R.Z., KONOBEYEV, B.I., PAKULIN, V.V., LASTOCHKINA, L.A., YARKOV, P.I. and ROMANOV, L.M.

[Abstract] A schematic is provided of a continuous plate column apparatus for the extraction of trioxane from aqueous solutions by benzene at 35-50°C. Testing conditions and results are described, which demonstrate that such an approach allows for extraction of 99.99% of the trioxane (vs. 99.00% for standard processes). The operating efficiency was in the 25-28% range (vs. 12.5% in the static process). Figures 1; references 6: 5 Russian, 1 Western.  
[238-12172]

## COAL GASIFICATION

UDC 669.162.12:622.785

### TRANSFORMATION OF IRON-CONTAINING COMPONENTS OF BROWN COALS DURING SPONTANEOUS COMBUSTION

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 2, Mar-Apr 84 (manuscript received 14 Feb 83) pp 19-24

VOYTKOVSKIY, Yu. B., ALEKSANDROV, I. V. and KAMNEVA, A. I., Moscow Mining Institute

[Abstract] The role of iron components in spontaneous combustion of coal has been shown to be both catalytic and supportive of burning. The present article reports on the effects of spontaneous heating and combustion on common grade brown coal samples under laboratory conditions using nuclear gamma-resonance spectroscopy with  $\text{Co}^{57}$  in a chromium matrix. East Siberian coal at 298 K initial temperature was found to reach 323 K 1 m below the surface in 28 days, and 348 K 8 days later. Following abundant precipitation, a site of spontaneous combustion was found. The phase composition of samples was found to be a key factor. The Karkinsk deposit showed low-temperature oxidation of iron-containing components. Various contents of pyrite, wuestite, hematite and magnetite affected vaporization, bubbling and eventual ignition. Problems of controlling the incubation period and secondary oxidation made accurate experimental results very difficult to obtain, but the nuclear gamma-resonance spectra confirmed assertions about the catalytic nature of iron-containing components of coal for the first time. Figures 3; references 8 (Russian).

[223-12131]

### DETERMINING ASH CONTENT OF COAL BY INTENSITY OF GAMMA RADIATION

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 2, Mar-Apr 84 (manuscript received 8 Feb 82) pp 41-45

PAK, Yu. N. and STARCHIK, L. P., Karaganda Polytechnic Institute

[Abstract] Nuclear physics methods for ash content monitoring is hampered by moisture, dimensional and composition factors. Gamma- or neutron radiation methods have become popular for preliminary checks with relatively



homogeneous coals. The present study reports on improvements to the authors' previously reported method (this journal, 1981 No 3); the adjustments improved resistance to interfering impurities and also brought higher selectivity. Results showed that increasing moisture increased gamma-quanta in the energy range above ~5 MEV, which were accompanied by radiation of thermal neutrons by nuclei of ash-forming elements. The authors sought to correct the magnitude of the ratio of intensities at an energy level of 2.23 MEV in hydrogen molecules. The intensity of gamma-quanta grew with increasing moisture content with energy above 5 MEV and in the 2.23 MEV range, but with 4.43 MEV it decreased. Chemical variations in the coal tested were eliminated from the measurement procedures. Iron was a particular problem in that it had increased radiation attraction for thermal neutrons. The proposed method compensated for this factor, and was found to be effective in assessing ash content regardless of moisture content. Figures 3; references 6 (Russian). [223-12131]

UDC 552.58:66.094.3

#### COMPOSITION OF PRODUCTS OF NITRIC ACID OXIDATION OF OIL SHALES

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 2, Mar-Apr 84 (manuscript received 1 Feb 83) pp 53-56

VESKI, R. E., BONDAR', Ye. B. and SIDOROVA, S. M., Institute of Chemistry, ESSR Academy of Sciences

[Abstract] Although the Kenderlyksk coal shale deposit of East Kazakhstan is 400 km from the railroad and at 1000-1800 m elevation, it is being considered for Kazakhstan's energy and chemical needs. The present article focuses on the aromatic fraction of organic material in the deposit's oil shale using harsh nitric acid oxidation to extract benzol-carboxylic acids. Pulverized samples equivalent to 2 g of organic material were mixed with 60 ml of 59.5% nitric acid with cooling for 5 minutes, then placed in reverse refrigerators in a calcium chloride bath heated to 105°C. Oxidation was controlled for 1 hour each at 105, 110, 115 and 120°C and for 2 hours at 122-123°C. Results testified to a range of 9.8-25.8% organic material in the undissolved products of oxidation. Gas chromatography showed these shales to produce much more benzol-carboxylic acid, and relatively less aliphatic monocarboxylic acids, than other oil shales. Pimelic acid predominated among dicarboxylic acids, while the presence of acids above adipinic confirmed the importance of straight-linked aliphatic structures, especially in shales of the Saykansk formation. The highest content of benzol-carboxylic acids, 11.6% of chromatographized acids and 0.71% of the initial organic material of the shale, was found in Kenderlyksk formation shale. Figures 2; references 8: all Russian. [223-12131]

## PRODUCTION OF MOTOR FUEL FROM KANSK-ACHINSK COALS

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 3, Mar 84 pp 5-8

KRICHKO, A.A., YULIN, M.K., MALOLETNEV, A.S. and PETROV, Yu.I., Institute of Mined Fuels

[Abstract] The 26th CPSU Congress adopted a resolution that effective methods must be developed for obtaining liquid fuels from brown coals of the Kansk-Achinsk coal field. Hydrogenation of solid fuel to liquids and gases is being studied at the Institute of Mined Fuels and an experimental unit for refining five tons of coal per day is under construction at the "Bel'kovskaya" mine by the "Novomoskovskugol" Production Association. In the present work, data are presented on the hydrogenation refining of liquid products obtained from the Irsha-Borodino coal deposit of the Kansk-Achinsk Basin. Motor fuels were obtained which have properties equal to or better than oil-based fuels. The diesel component has a high-aromatics content. Figure 1; references 5: 4 Russian, 1 Western.  
[219-12765]

UDC 662.74.1.355.002.5:621.869.2:658.516.2

## STANDARDIZING AND IMPROVING UNLOADING EQUIPMENT AT DRY COKE SLAKING INSTALLATIONS

Moscow KOKS I KHIMIYA in Russian No 3, Mar 84 pp 33-36

AZIMOV, A. A., BRANTOV, A. A. and TISHCHENKO, O. N., Design Bureau, Coal Tar Machinebuilding, State Research and Planning Institute for Coke, and SUSLOV, A. N., State Research and Planning Institute for Coke

[Abstract] With growing interest in dry coke slaking and the diversity of equipment being used in the industry, the need for improved unloading devices has grown. The present article describes equipment designed to provide dependable isolation of the unloading tract, increase reliability of control and closing devices operating under high temperature, corrosion and abrasion conditions, prevent undesired opening of vales and gates, provide temperature control and feed of coke onto the conveyor belt with acceptable reserve capacity, and reduce consumption of energy and metals while providing improved dependability. Both equipment that loads directly onto conveyor belts and installations with an intermediate loading ramp can be serviced by the devices diagrammed and discussed. A sector-closing gate of welded iron plates, transferring hoppers of iron and/or steel, and distribution bins with two individually operated gates, are described. Hydraulic control systems unique for Soviet equipment of this type are used. Tests at the Avdeyev and Makeyev coal tar plants have shown the efficiency and dependability of the described machinery. Safety controls prevent undesired functioning of opening devices and temperature control systems. Figures 2; references 4 (Russian).  
[203-12131]

## USE OF POLYMERS OF BENZENE FRACTION FOR PREPARING COAL-TAR LUBRICANTS

Moscow KOKS I KIMIYA in Russian No 3, Mar 84 pp 50-52

SHABOVTA, S. I., MUZYCHUK, V. D. and KURKIN, V. V., Karaganda Metallurgical Combine

[Abstract] Chemical lines of coal tar plants have significant amounts of liquid and solid by-products, totaling more than 460,000 tons per year, of which 35% are of the benzene fraction. While attempts have been made to separate and use some of these wastes for polymers, precise parameters have not previously been determined. At the Karaganda Metallurgical Combine, polymers of the benzene fraction were used in producing coal-tar cross-tie impregnations and anthracene lubricants. The polymers used had densities of 1110-1130 kg/m<sup>3</sup> and 2-10% water content; the anthracene fraction had a density of 1140 kg/m<sup>3</sup>. Tests showed that polymers with more than 5% water could not be used. Polymers could be used to replace 15-20% of absorptive oils without lowering the quality of anthracene lubricants; the amount of distillates at temperatures up to 235°C increased somewhat but did not exceed accepted standards. Figure 1; references 5 (Russian).

[203-12131]

UDC 541.11.127

INTERACTION OF CHAINS DURING INDUCTION PERIOD OF BRANCHED CHAIN BREAKDOWN OF NITROGEN TRICHLORIDE

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 3, No 3, Mar 84 (manuscript received 7 Feb 83) pp 414-419

MARKEVICH, Ye. A. and AZATYAN, V. V., Institute of Chemical Physics, USSR Academy of Sciences, Moscow

[Abstract] In previous studies, a branched-chain mechanism was proposed for the breakdown of  $\text{NCl}_3$ . However, in these studies only a "linear" pattern was considered during the induction period, which could explain a number of kinetic regularities of  $\text{NCl}_3$  breakdown; one of the unexplained aspects was the effect of photochemical initiation on the induction period of the ignition of  $\text{NCl}_3$ . The present investigation of the induction periods of initiated and non-initiated inflammation in presence of and without an initiator showed that the interaction between reactive chains does have an effect during the developed combustion process as well as during the induction period. In a special series of experiments it was established that in a given range of initial pressures within the self-ignition area, the induction period did not change and that in this interval practically no consumption of  $\text{NCl}_3$  could be observed during the induction. Inclusion of additional nonlinear reactions in the process made it possible to explain data of artificial initiation of the phenomenon and the results of the delay periods of inhibited ignition. Figures 3; references 20: 13 Russian, 7 Western.  
[200-7813]

## COMPARISON CRITERIA FOR EXPERIMENTAL AND CALCULATED RETARDATION OF IGNITION

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 3, No 3, Mar 84 (manuscript received 15 Mar 83) pp 420-429

BORISOV, A. A., LISYANSKIY, V. V., SKACHKOV, G. I. and TROSHIN, K. Ya.,  
Institute of Chemical Physics, USSR Academy of Sciences, Moscow

[Abstract] Inflammation retardation of a reactive gaseous mixture is an important characteristic of the combustion process of many fuels. In the present paper the following kinetic models of the ignition process were studied: reaction of monomolecular breakdown, non-branched and branched-chain reactions. Theoretical analysis was performed on the effect of the burning out of starting materials and of the heat removal into the reaction vessel walls on experimentally determined ignition retardation. The experimental data showed that in practical static equipment the heat removal and the burning out of the starting material could lead at best to a 2-fold change in the ignition retardation in comparison to calculated values obtained under adiabatic assumptions. Criteria for determining the ignition retardation were proposed resulting in best possible agreement between experimental and calculated values. Another important aspect of the flow turbulence was the introduction of fresh mixtures capable of rapid mixing with the gas already present, leading to significant lowering of the effect of adiabatic compression of heated gas components. Figures 3; references 9: 8 Russian, 1 Western.  
[200-7813]

## GAS EMISSION FROM IMPURITIES DURING FREE GAS COMBUSTION OF TRANSITION METALS MIXED WITH BORON

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 3, No 3, Mar 84 (manuscript received 3 Feb 83) pp 430-434

FILONENKO, A. K. and VERSHINNIKOV, V. I., Division of the Institute of Chemical Physics, USSR Academy of Sciences, Chernogolovka

[Abstract] In the present work, regulations were investigated governing gas formation during combustion of powder mixtures of non-melting metals from the IV and V groups (Ti, Zr, Hf, Nb, Ta) with amorphous boron, burning by the non-gaseous mechanism. The principal component was present in at least 98%: possible impurities could have included:  $H_2$ ,  $O_2$ ,  $N_2$ , Cl, Fe, Ni, Ca, Mg, Al, Si and C. The following parameters were studied: impurities, component ratios and their dispersion, external pressure and combustion temperature. It was shown that non-gaseous combustion could be accompanied by considerable gas generation from impurities in metals as well as in boron. The principal component of the emitted gases is hydrogen. To lower this gas generation, one must diminish the content of impurities. Figures 2; references 10 (Russian).  
[200-7813]

## CALCULATION OF FLOWS WITH DETONATION WAVES

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 3, No 3, Mar 84 (manuscript received 21 Apr 83) pp 435-442

GEL'FAND, B. Ye., GUBIN, S. A., MIKHALKIN, V. N. and SHARGATOV, V. A., Institute of Chemical Physics, USSR Academy of Sciences, Moscow

[Abstract] Calculation of the flows in presence of detonation waves in combusting gas mixtures and condensed explosives is required for solving many questions of the evaluation of explosions, interactions between shock and detonation waves, the flows occurring during explosions of charges with varying geometry, membrane destruction and propulsion due to the explosion. The effect of gas heat capacity at constant pressure and volume and the index of polymorphism of detonation products on gas dynamics flow calculations was analyzed showing that the assumptions made in the past about their constancy led to errors in various calculations, especially of the two-phase flow of detonation products over solid particles. Suggestion was made to use an equation for the composition of detonation products based on approximation of thermodynamic parameters during isentropic expansion. Figures 3; references 18: 12 Russian, 6 Western.  
[200-7813]

UDC 541.124:541.126

## STRUCTURE OF CHAIN-HEAT LIMITS OF SELF-IGNITION

Moscow KINETIKA I KATALIZ in Russian Vol 25, No 1, Jan-Feb 84 (manuscript received 10 Nov 80) pp 5-12

BABUSHOK, V. I., KRAKHTINOVA, T. V. and BABKIN, V. S., Institute of Chemical Kinetics and Combustion, Siberian Department of USSR Academy of Sciences, Novosibirsk

[Abstract] The goal of the study was to carry out quantitative study of the structure of the transition zone and general regularities of transition from a slow reaction course to an explosive regimen based on a branched-chain reaction of hydrogen oxidation. In addition an attempt was made to obtain data on the width of the transition zone at the second and third limits and on the changes among various stages of chemical reactions across these limits. The task was solved in the framework of nonstationary heat explosion theory for branched chain reaction of hydrogen oxidation in a spherical vessel with reflecting walls. The analysis showed that the transition zone is characterized by a sharp increase of the role of quadratic stages; their input into consumption of H and HO<sub>2</sub> is maximum in this zone. Comparison of these data with other calculations appeared to lead to agreement. It was concluded that the regularities observed for this simple system should be applicable also to other reactions with heat and chain-heat regimens. Figures 4; references 25: 16 Russian, 9 Western.  
[230-7813]

SYNTHESIS OF TRIAZOLE AND TETRAZOLE ESTERS

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA  
TEKHNOLOGIYA in Russian Vol 27, No 2, Feb 84 (manuscript received 13 Jul 82)  
pp 1 177

MAKSIKOVA, A. V., SUKHANOV, G.P., VERESHCHAGIN, L. I. and GAREYEV, G. A.,  
Laboratory of Organic Synthesis, Institute of Petroleum and Coal Chemical  
Synthesis, Irkutsk State University imeni A. A. Zhdanov

[Abstract] Esters of 1, 2, 3- and 1, 2, 4-triazoles and tetrazoles were  
synthesized in order to seek effective flame-damping compounds which do not  
support the combustion of nitrogen-containing plasticizers and monomers.  
Ethers and esters were synthesized by the classical method of interacting  
oxyalkylazoles with alkyl halides and acyls. Vinyl 1, 2, 3-triazole  
esters were synthesized using direct vinylation of 4-oxymethyl-1, 2, 3-  
triazole with acetylene under pressure in the presence of caustic potash at  
170°C. References 4: 3 Russian, 1 Western.  
[221-6508]

UDC: 620.193:621.031

PROBLEM OF MECHANISM OF ELECTROREDUCTION OF OXYGEN ON STEEL ELECTRODE IN  
NEUTRAL MEDIA

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA  
TEKHNOLOGIYA in Russian Vol 27, No 2, Feb 84 (manuscript received 4 Feb 82)  
pp 206-209

KUZNETSOV, V. A. and NELAYEV, I. P., Department of General and Special  
Chemistry, Ural State University imeni A. M. Gor'kiy, Tyumen Construction  
Engineering Institute

[Abstract] A steel disk was used to gradually measure the cathode curve of a steady potential of 0.44 to 0.45 v up to 1.0-1.1 v, yielding points of 0.001  $\mu$ A to 5-8  $\mu$ A, establishing the linear variation of corrosion rate as a function of the square root of the rotating speed of the rotating disk electrode. The experimental data and accompanying calculations indicate that as the potential is displaced into the negative area there is an increase in the quantity of hydrogen peroxide formed. The method of preliminary preparation of the steel electrode is determined to have a direct influence on the rate of the individual stages of the process of electroreduction of oxygen. A diagram illustrates the influence of the processes which occur on the rate of electroreduction of oxygen. This diagram indicates the presence on the surface of the steel electrode of various forms of oxygen, not only adsorbed, but also oxygen included in the composition of oxides, influencing the rate of each stage of the electroreduction of oxygen. Figures 4; references 4 (Russian).

[221-6508]



## ELECTRIC CONDUCTIVITY OF HYDROCARBON SOLUTIONS OF BARIUM DIALKYLDITHIOPHOSPHATE

Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR, SERIYA B: GEOLOGICHESKIYE, KHIMICHESKIYE I BIOLOGICHESKIYE NAUKI in Russian No 3, Mar 84 (manuscript received 12 Jul 83) pp 48-50

PILIPENKO, A.T., ZHARINOVA, T.A., academician, Ukrainian SSR Academy of Sciences, YAKUBENKO, L.N. and FALENDYSH, N.F., Institute of Colloid Chemistry and Water Chemistry, Ukrainian SSR Academy of Sciences, Kiev

[Abstract] Determinations were made of the electric conductivity of barium di (2-ethyl-hexyl) dithiophosphate in hexane at 297, 306 and 323°K in relation to concentration and dissociation constants. At low concentrations of the dithiophosphate, dilution leads to a sharp increase in molal conductivity which was ascribed to dissociation of the dithiophosphate surfactant. At higher concentrations ( $2 \times 10^{-5}$  to  $10^2$  kmoles/m<sup>3</sup>) IR spectroscopy indicated the formation of dimers, which in turn favored charge transfer between dimers, a weakening of the bond between the barium atom and thiol sulfur and an increase in the degree of dissociation in comparison with the monomer, which led to a further increase in conductivity. Formation of dithiophosphate trimers was accompanied by a further weakening of the barium-thiol sulfur bond and a further increase in conductivity of the hexane solution. At concentrations greater than  $10^{-2}$  kmoles/m<sup>3</sup> positively-charged spherical micelles are formed and contribute to a sharp rise in conductivity. However, at  $8 \times 10^{-2}$  kmoles/m<sup>3</sup> the micelles coalesce into aggregates with a smaller charge that lead to a sudden decrease in conductivity. Figures 2; references 10: 7 Russian, 3 Western.  
[235-12172]

## EQUIPMENT DELIVERY FAILURES PLAGUE FERTILIZER INDUSTRY BUILDERS

Moscow STROITEL'NAYA GAZETA in Russian 4 May 84 p 1

[Letter signed by Hero of Socialist Labor P. Goncharov, brigade leader, Dzhambulkhimstroy Trust; Kazakh SSR State Prize Laureate I. Afanasiadi, brigade leader, Dzhambulkhimstroy Trust; Cavalier of the Order of Labor Glory 3d Degree L. Burnaykina, brigade leader, Kasteplioizolyatsiya Trust; and Cavalier of the Order of the Red Labor Banner I. Chakalidi, brigade leader, Kazkhimmontazh Trust: "Hastening the Deliveries"]

[Text] A start-to-finish flow line brigade contract for erection of mineral fertilizer production capacities at the Karatau-Dzhambul Territorial Production Complex has now been in effect for its third year, and competition has been organized in accordance with the "workers relay" principle.

This made it possible to successfully introduce a number of output capacities at the Novo-Dzhambulskiy Phosphorus Plant and the Dzhambul Khimprom Association.

But at the same time there was a disappointing failure last year in erection of capacities for the production of 60,000 tons of sodium tripolyphosphate at the Novo-Dzhambulskiy Phosphorus Plant. This installation was not placed into operation by the deadline. The client let the builders down because he failed to supply production and nonstandardized equipment to the construction site. As a result 15 construction and installation administrations were unable to fulfill their contracted obligations.

This year we are also to commission a number of output capacities at the Novo-Dzhambulskiy Phosphorus Plant of the Ministry of Mineral Fertilizer Production and the Khimprom Association. We pledged to make some of them ready ahead of schedule. In particular the sodium tripolyphosphate production shop is to be completed before 30 November.

But this is precisely the facility which is causing us the greatest alarm. We fear that the client might let us down again. He did provide us with an equipment delivery schedule, but the deadlines indicated in it are not at all to our liking. Some of the equipment is scheduled to arrive in the third quarter. And this means that we will not only fail to satisfy our pledges, but we may also have to wait until the end of the year to make this facility operational. After all, the standards allow 8 months for installation of the equipment.

Moreover the schedule makes no mention of deliveries of 90 kilometers of power cable, 61 kilometers of control cable and 1,576 units of shut-off fittings.

We appeal to our client--the Ministry of Mineral Fertilizer Production--and the suppliers to send all of the lacking equipment in the second quarter.

11004

CSO:1841/240

## INORGANIC COMPOUNDS

### SUPERIONIC CONDUCTORS. ANOMALOUSLY HIGH IONIC CONDUCTIVITY IN INORGANIC FLUORIDES

Novosibirsk IZVESTIYA SIBIRSKOGO OTDELENIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKIKH NAUK in Russian Vol 1, No 2, Jan-Feb 84 (manuscript received 22 Oct 82) pp 53-61

MURIN, I. V., Leningrad State University imeni A. A. Zhdanov

[Abstract] Anomalously high ionic conductivity has been noted in numerous binary and multi-component crystalline and glass-like materials in recent years. Sub-types are solid electrolytes with their own or impurity-carried randomness or randomness based on structure. Their variety is great and no general theory of their function has been developed. The present article reports on ionic and electron transfer in a broad class of inorganic fluorides with fluorite or tisonite structure, as well as solid electrolytes based on double fluorides of tin, uranium and thorium. A method of heterovalent additions showed that in pure monocrystals of beta-PbF<sub>2</sub> a vacant space ionic transfer mechanism prevailed. The low structural density and complex isomorphic substitutions joined with inherent randomness at high temperatures to promote formation of solid solutions of these fluorite superconductors. Tisonite varieties showed trifluorides of rare earth minerals in crystals, along with actionoids and difluoride bertollid phases. Solid electrolytes based on SnF<sub>2</sub> showed high electron polarity of ions with an external electron configuration that suggested their high electronic value. NMR of <sup>19</sup>F confirmed the imbalance of the fluorine ions in these compounds. Study of the effect of high hydrostatic pressure on electrical conductivity gave further data on active capacity and defect migration in the superconductors. Low electron and high ion conductivity make solid electrolytes based on fluorides of Pb(II), Sn(II), lanthanoids, U(IV) and thorium very promising for practical applications. Figures 5; references 2: 11 Russian, 11 Western.  
[224-12131]

## PHYSICAL-CHEMICAL STUDY OF CALCIUM AND STRONTIUM SULFATE COCRYSTALLIZATION PROCESSES

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 2, Feb 84 (manuscript received 2 Jul 82) pp 249-254

BUSHUYEV, N.N., KOSTYUK, A.G. and KAZAK, V.G., Scientific-Research Institute of Fertilizers and Insectofungicides, Moscow

[Abstract] When phosphate ore is treated with sulfuric acid to make extraction-grade phosphoric acid for fertilizers, calcium sulfate is precipitated in the dihydrate, semi-hydrate and water-soluble anhydrite forms. Since most natural phosphate ores also contain other useful elements including strontium, which has an increasingly practical significance in certain areas of technology, an X-ray diffraction study of the interaction of calcium and strontium sulfates over a wide range of temperatures and concentrations was undertaken. The study shows that strontium sulfate is chemically inert to all three crystal forms of calcium sulfate and that it does not form double compounds nor is there any isomorphic displacement. An especially pure "separation" of strontium sulfate was observed during cocrystallization with calcium sulfate dihydrate. Under the conditions of sulfuric and nitric acid treatment of phosphate ore to produce phosphoric acid and mixed fertilizers, strontium sulfate can be separated as an independent phase without reacting with the dihydrate or semi-hydrate forms of calcium sulfate. References 7: 6 Russian, 1 Western.  
[201-12765]

## PHOTOSTIMULATED THERMOLUMINESCENCE OF RADIATION-COLORED QUARTZ

Leningrad FIZIKA I KHIMIYA STEKLA in Russian Vol 10, No 1, Jan-Feb 84 (manuscript received 22 Jul 82) pp 24-30

KORNIYENKO, L.S., RYBALTOVSKIY, A.O., SIMAKIN, I.O. and CHERNOV, P.V., Scientific Research Institute of Nuclear Physics, Moscow State University imeni M.V. Lomonosov

[Abstract] Photostimulated thermoluminescence was employed in studies on gamma radiation ( $\text{Co}^{60}$  source, ca. 700 rad/sec)-induced color centers in quartz samples cooled to 77°K. The spectral patterns revealed two photostimulated peaks at 130-140 and 260-290°K, indicating charge release as a result of color center breakdown at temperatures above 300°K. In KSG glass (containing  $2.8 \times 10^{-1}$  wt% hydroxyl groups and ca.  $6 \times 10^{-5}$  wt% transition metal ions) an additional peak was detected at 110-120°K due to breakdown of atomic hydrogen centers. These findings were used to infer that on heating of the irradiated glasses charge carriers are released from deep traps and, before

recombination, pass through an intermediate state represented by the peaks at 130-140 and 260-290°K. The distinct temperatures indicate that photostimulated thermoluminescence is a discontinuous, stepwise, process. Figures 5; references 12: 9 Russian, 3 Western.  
[237-12172]

UDC 660.11.01:621.383.811

#### THERMAL SURFACE CHANGES OF REDUCED LEAD GLASS

Leningrad FIZIKA I KHIMIYA STEKLA in Russian Vol 10, No 1, Jan-Feb 84 (manuscript received 17 Aug 82) pp 75-78

GRAVEL', L.A., LEONOV, N.B., NOVIKOV, Yu.B., TOISEVA, M.N. and TYUTIKOV, A.M., State Optical Institute imeni S.I. Vavilov, Leningrad

[Abstract] Studies were conducted on lead glass emission in the IR region before and after reduction with hydrogen at 400°C and before and after degasification, to determine the factor leading to high noise levels when such glass is used in current amplification equipment. The results, confirmed by Auger spectra of the lead glass surface indicate that high noise levels are predicated on the presence of carbon oxides, oxygen and hydrogen on the glass surface which are dislodged by an electronic current. The presence of carbon oxides and hydrocarbons on the surface reduce the coefficient of secondary electronic emission and lead to the formation of reversible ionic bonds responsible for high noise levels. The presence of the carbon radicals on the surface results from their diffusion from the glass itself. Figures 2; references 9: 8 Russian, 1 Western.  
[237-12172]

UDC 661.418.1.001

#### EFFECTS OF SODIUM CYANIDE AND CYANATE ADMIXTURES ON ELECTROLYTIC PRODUCTS OF SODIUM CHLORIDE SOLUTIONS

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 3, Mar 84 pp 162-163

MULIN, Ye. V. and TARASENKOVA, V.P.

[Abstract] An evaluation was made of the effects of sodium cyanide and sodium cyanate admixtures on the product composition following electrolysis of sodium chloride solutions. Analysis of the course of the reaction and products obtained by electrolysis of a solution containing 310 gm/liter NaCl, using graphite anodes and an asbestos diaphragm at 90°C and 0.1 A/cm<sup>2</sup> current, showed the production of a gas mixture consisting of Cl<sub>2</sub>, CO<sub>2</sub>, O<sub>2</sub> and ClCN. The percentage of each component was dependent on the concentration of the admixtures, with ClCN ranging up to 0.040 vol%. These observations indicate the need for an alkaline absorption step for the conversion

of ClCN into sodium cyanate. In addition, production of ClCN can be reduced to negligible levels by the dilution of the contaminated solutions with uncontaminated brine to reduce the sodium cyanate levels to permissible concentrations (0.1 mg/liter). Figures 1; references 5: 3 Russian, 2 Western. [238-12172]

## PETROLEUM PROCESSING TECHNOLOGY

### METHANOL PRODUCED FROM ETHYLENE WASTE GASES

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 8 Apr 84 p 2

[Article by V. Mikhaylichenko, Severodonetsk, Voroshilovgrad Oblast in column "Industrial Chronicle": "Methanol from Waste Products"]

[Text] At the Severodonetsk Production Association Azot, a plant which has a calculated annual output of 100,000 tons of methanol--a raw material for production of plastics--has been finished at project capacity. For the first time a mainly new technology has been used at the plant; it enables a valuable product to be obtained not from natural gas, as was done previously, but from waste gases from ethylene production.

According to the calculations of Association specialists, the economic effect from the introduction of the new plant exceeds a million rubles per year. Moreover, above the pipes of the production framework one does not now see the flares of flames in which the waste gases are burning.

12410

CSO: 1841/231



HIGH QUALITY GASOLINE PRODUCED WITHOUT ADDITIVES

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 8 Apr 84 p 2

[Article from TASS in column "Industrial Chronicle": "Ultra-pure Gasoline"]

[Text] Automobile fuel not requiring high-octane additives has been obtained by staff members of the Institute of Petrochemical Processes of the Azerbaijan SSR Academy of Sciences. It enables the costs for refining petroleum products to be lowered by 10 percent.

High-quality AI-93 gasoline is obtained by means of a two-stage treatment of so-called heavy petroleum fractions with the use of an industrial catalyst. The use of purified gasoline avoids the need for toxic additives, which increase the content of harmful contaminants in exhaust gases.

12410

CSO: 1841/231

## TYUMEN ASSOCIATION PRODUCES 1 TRILLION CUBIC METERS OF GAS

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 28 Apr 84 p 1

[Article by M. Umanskiy, Tyumen: "On the Meter---A Trillion!]

[Text] A trillion cubic meters of natural gas have been transported from the gas fields of the Tyumen Oblast since the beginning of their exploitation by workers of the Tyumentransgas Production Association.

"Today Tyumentransgaz is eight operating gas pipelines extending for more than 12,000 kilometers, through which are pumped more than a third of all gas produced in this country," V. Kosachev, its chief engineer tells me in the central dispatching office. There are dozens of compressors accelerating the flow of the gas stream. The total power of all our gas pumping units is about five million kilowatts, which exceeds the power of the Bratsk hydro-electric power station.

"From here, from the central dispatching office, it is possible to regulate the gas flow effectively by increasing or decreasing the delivery of fuel to consumers. Computer technology helps to do this by prior calculation of dozens of variables in order to provide reliable operation of the complex gas pipeline system. And now if something quite unexpected happens: a landslide or, let us assume, an earthquake has damaged a pipeline somewhere in the remote taiga? Until now the repair team has come to the place and repaired the damage."

But also such an almost improbable disaster will not catch the gas transport workers by surprise.

At the Komsomol compressor station they showed me a small ordinary-looking key lying in a little transparent plastic box on the console.

"This is the remote control key," explained the compressor chief S. Lynov. "If an irregular situation comes up somewhere on the pipeline as we speak, the sensors immediately send a warning signal through the radio relay station. In this case the dispatcher puts the key in the correct slot and dials a certain code. A multiton ball cock located every ten kilometers spans the route of the flow carried along the pipe at the place of breakage.

At the same time the gas stream does not shut down for an instant. All seven pipelines going from the south of the oblast are connected by "safety connectors". And if there is a shut-off of one or even more streams, the gas simply will go along another route temporarily. Industrial centers, consuming the valuable fuel, experience practically no reduction. Gas producers from the Ukraine, Azerbaijan, Turkmenia and Orenburg came to serve an honorary watch devoted to the significant event, to Komsomol line-production control. They have Tyumen experts, such as machinists of technological units to teach them--the USSR State Prize laureate V. Barulev, M. Pachenkov and V. Popov, the senior dispatcher V. Ryasnov, the locksmith R. Arafonov and other standing competitive workers.

This year the collective of the Tyumentransgaz Association has pledged to increase labor productivity by 1.1 percent above the plan and additionally to lower the transport cost of "blue" fuel by 0.6 percent. They take their word firmly.

Toward the end of the day, the chief dispatcher Yu. Buturlakin traced a unit in the log-book with twelve zeros. Tyumentransgaz was opening the account of the second trillion cubic meters of Siberian gas.

12410

CSO: 1841/231

## NEW METHANOL AND FORMALIN PLANT AT TOMSK

Moscow TRUD in Russian 7 Apr 84 p 1

[Article by Yu. Shcherbinin, correspondent for the newspaper KRASNOYE ZNAMYA and Yu. Kotlyarov, correspondent for TRUD, Tomsk, in column "TRUD at the Tomsk Chemical Plant": "A Giant Has Arisen in the Taiga"]

[Text] Participants in the building of a complex for production of methanol at the Tomsk chemical plant received the welcome of the CPSU Central Committee with enthusiasm and gratitude. Yesterday, on April 6, a mass meeting took place at this enterprise. First secretary of the CPSU Tomsk obkom, A. Mel'nikov, gave the welcome speech. Then the chief administrator of Khimstroy, P. Promyagin, the chief of methanol production, A. Shchuchkin, brigade leader of finishing work, N. Lobazhevich, brigade leader of installation, N. Nemin, and others came forward and gave heartfelt thanks to the Lenin Central Committee for constant care and great appreciation for their work.

This complex is the largest in this country and in the world. We produce a little over 2 million tons of methanol annually at about 20 enterprises. In Tomsk, at only one plant, which has a fantastic capacity however, 750,000 tons are produced annually. This in truth is a shop of abundance inasmuch as all the Tomsk methanol is reserved for conversion into consumer goods.

The whole country built the projects of the unique complex. Subsections of eight ministries, enterprises and organizations of dozens of cities participated on the Tom River. Under the most difficult conditions, in the taiga and marshlands, builders and assemblers with short deadlines put up the production housing. Powerful purifying equipment serving not only the enterprise but also the whole city was also put into use at the same time. Here 230,000 square meters of homes, the Kuzovlevsk hot-house combine, the largest in Siberia, and other large-scale projects were built.

The construction brought out a lot of remarkable people. The brigade leader Petr Shumnyi and Sergey Kovalkin, who was honored with the Lenin Komsomol prize for participation in constructing the complex, and many other members of the collective received homage. Operators also worked with assemblers on the start-up projects. This enabled the operators-chemists Aleksandr Postol'-nik and Viktor Feyer and others to master the most complex equipment.

Now the builders of the methanol complex, by using rich experience, at an accelerated pace are erecting the third section of the plant--the heavy-duty production of formalin, which, as has already been reported, the newspaper "Trud" patronized.

The participants in the meeting, inspired by the high evaluation of the achievements of the collectives wrote a letter in response to the CPSU Central Committee. In it the operators certified that, by mastering the unique equipment, they will produce 25,000 tons of methanol this year above the plan; they will raise the labor productivity above the task by 3 percent, and, by that much, lower the production cost. The construction workers declared that they are fully resolved to deliver the formalin complex ahead of schedule.

12410

CSO: 1841/231

TEST RESULTS FOR EXPERIMENTAL GENERAL USE COMPRESSOR WITH 12 m<sup>3</sup>/min CAPACITY

Moscow KHIMICHESKOYE I NEFTYANOYE MASHINOSTROYENIYE in Russian No 3, Mar 84  
pp 5-6

SERDAKOV, M. A. and PROSTOROV, I.S., candidates of technical sciences and  
VISHNYAKOVA, A. I. and ARKHIPOV, A. D., engineers

[Abstract] The present article reports on a general-use compressor produced at the Leningrad Scientific Research Institute for Chemical Machinebuilding with 0.88 MPa, 12 m<sup>3</sup>/min capacity, piston stroke of 0.11 m and a 75 KWT motor. Its application to a first-stage refrigerator showed that the coefficient of heat transfer with 5 tubes increased 2 times, while the degree of cooling shortfall was cut to 8-12 K. With 4 tubes, the cooling shortfall was increased to 5-7 K, and without turbulization, to 3-4 K. No added efficiency was realized when the compressor was coupled to a second-stage refrigerator. Varying water-cooling flow rates, from 0.05 to 0.3 liter/sec, determined that no further effect was achieved by increasing water feed above 0.1 l/s. No differences were noted for the various valves tested. Piston rings of PTK textolite were found to be more efficient than those of fluoroplast 4K-20, which, however, lasted 3000 hours compared to 600 hours for the former. Figures 2; references 2 (Russian).  
[226-12131]

## DEVELOPING UNIFORM CENTRIFUGAL COMPRESSOR STAGES

Moscow KHIMICHESKOYE I NEFTYANOYE MASHINOSTROYENIYE in Russian No 3, Mar 84  
pp 9-12

SELEZNEV, K. P. and GALERKIN, Yu. B., doctors of technical sciences, MITROFANOV, V. P., candidate of technical sciences and LOKTAYEV, S. V., ZARAYEV, V. I. and SERGACHEVA, E. I., engineers

[Abstract] Significant economies can be achieved by new designs of circulating parts of centrifugal compressors to stress standardization and uniformity. Limitations on blade height conflict with efficiency needs. Designers at the Leningrad Polytechnic Institute imeni M. I. Kalinin have developed two series of standardized model compressor stages, which are described in the present article. It summarizes selection of dimensions for entry into the operational chamber determination of the angle of inclination of the cover, blade profile, selection of stationary components, and assessment of effectiveness of compressor stages and elements. Calculations show high effectiveness of the standardized stages with little operational loss, and experimental data confirm these parameters. It would be possible to increase efficiency by sacrificing the degree of standardization achieved. Figures 5; references 3 (Russian).  
[225-12131]

IMPROVING CIRCULATING PART OF AXIAL COMPRESSORS FOR GAS TURBINE INSTALLATIONS

Moscow KHIMICHESKOYE I NEFTYANOYE MASHINOSTROYENIYE in Russian No 3, Mar 84  
pp 12-14

TARABRIN, A. P. and BUYNOVSKAYA, L. N., candidates of technical sciences and  
NARYSHKIN, V. F. and KUSHNER, Zh. L., engineers

[Abstract] The Scientific Production Association of the Central Scientific Research and Boiler-Turbine Project Design Institute imeni I. I. Polzunov has developed effective input and output axial compressors to complement its turbine line. Parameters for blade and chamber design and calculations to attain high efficiency are presented. The mathematical model was tested on a 0.553 : 1 scale model with axial circulation input. The special vibration-damped blades of the test compressor provided 7% better consumption than the original blades. Model tests showed that the experimental device produced 3% less compression than anticipated. Supplemental designs were then prepared and tested. The effects of input nozzle variations are also discussed.

Figures 4.

[226-12131]

IMPROVING NATURAL GAS COMPRESSION RINGS

Moscow KHIMICHESKOYE I NEFTYANOYE MASHINOSTROYENIYE in Russian No 3, Mar 84  
pp 15-16

VELIKANOV, G. F., candidate of technical sciences, SARANTSEV, K. B. and  
ARKHIPOV, V. V., engineers and RAYER, G. A., doctor of technical sciences

[Abstract] The "Nevskiy Zavod" Production Association imeni V. I. Lenin has developed a number of designs to improve reliability and economic parameters of natural gas compression chambers that previously have worn out rapidly causing accidents, unplanned work stoppages and losses of efficiency. One aspect of the resulting designs is a pressure reduction that makes it possible to use readily welded 14Ch2GMR low-alloyed steel in place of 34ChN3M steel. Loss of design buffering required correction, however, and the present article reports on efforts to reduce dynamic tension by altering blade design and making complementary compression and pipeline elements. Mass-production compression chambers provided dependable and economical operation on technically monitored pipelines, but with reduced volume, difficulties arose. Design improvements took account of high-wear points of compressor blades and acceptable pressure limits. The new design included short blades that could be of thinner material with enhanced wear qualities due to tension reductions. Cheaper welding and in general, cheaper materials were made possible. Figures 2; references 6 (Russian).

[226-12131]

## DI-195 RAM SCREW ENGINE

Moscow KHIMICHESKOYE I NEFTYANOYE MASHINOSTROYENIYE in Russian No 3, Mar 84  
pp 18-19

GERDEL', V. Ya. engineer

[Abstract] The All-Union Scientific Research Institute for Drilling Technology and its Perm branch have designed the DI-195 ram-screw engine for oil and gas drilling with diameters of 215.9-244.5 mm using water as the lubricant along with a clay solution with density of  $2 \cdot 10^3 \text{ kg/m}^3$ . It is based on a rotary hydraulic principle, with the three basic components of the motor section, the spindle shaft and the valve, all joined by locking grooves. Each section is diagrammed and described. The rotation of the rotor in combination with the geometric shift of position of the stator generates liquid lubricant flow and continues the bore, whose rate can be controlled by adjusting hydraulic pressure on the valves. The spindle section can withstand pressures of up to 8-10 MPa. The drilling engine is currently in use by "Tatneft'", "Permneft'" and "Bashneft'" drilling associations. Figure 1.  
[226-12131]

## EFFECTIVENESS OF OBTAINING ALKENES FROM VACUUM GAS OIL

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 3, Mar 84 pp 15-16

DMITRIYEV, V.M. and GORISLAVETS, S.A., Institute of Gas, UkSSR Academy of Sciences

[Abstract] The price increase for oil products and the shortage of hydrocarbon gases and gasoline fractions have stimulated the use of vacuum gas oil fractions for pyrolysis. Vacuum gas oil contains the same classes of hydrocarbons as the gasoline fractions but it has a much higher sulfur and aromatic hydrocarbon content. The latter causes coking and prolongs the residence time in the pyrolysis furnace. Laboratory scale research conducted at the Institute of Gas, UkSSR Academy of Sciences on the pyrolysis of vacuum gas oil from Kremenchug Oil Refinery in a panel type tubular reactor showed that this type of feedstock can be effectively refined. Figure 1; references 10: 3 Russian, 7 Western.  
[219-12765]



## EFFECT OF CHEMICAL COMPOSITION OF VACUUM GAS OIL FRACTION ON PYROLYSIS RESULTS

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 3, Mar 84 pp 16-18

VASIL'YEVA, I.I., ZHOROV, Yu. M. and VOLOKHOVA, G.S., Moscow Order of Labor Red Banner Institute of Petrochemical and Gas Industries imeni I.M. Gubkin

[Abstract] Depending on the nature of the oil and the boiling point range, vacuum gas oil fractions differ widely in chemical composition. It is also known that the presence of polycyclic aromatic hydrocarbons causes a low yield of ethylene. To clarify whether or not an interrelationship exists between individual hydrocarbon groups during pyrolysis, and whether it is the chemical composition or the boiling point range (fraction) that determines pyrolysis results, a study was made of the pyrolysis of five gas oil fractions differing in fractional and chemical composition, in a continuous reactor at 800°C and 0.25 sec contact time. Fraction III, containing 20% more naphthenes than Fraction I but having the same fractional composition, gave a 14-20% higher ethylene yield. Fractions IV and V had the same aromatic hydrocarbon content, but the absence of polycyclic aromatics and sulfur compounds in V resulted in a higher ethylene yield. Equations are presented which may be used to make a semiquantitative determination of the relative change in product yield in relation to the chemical composition of the feedstock. Figure 1; references 7: 4 Russian, 3 Western.  
[219-12765]

## EFFECTIVENESS OF ANTIWEAR ADDITIVES IN OILS CONTAINING ADDITIVE IKhP-234

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 3, Mar 84 pp 21-22

KULIYEV, A.B., IMANOVA, G.I., KULIYEV, F.A. and ABDULLAYEV, B.I., Institute of Chemistry of Additives, AzSSR Academy of Sciences

[Abstract] Results are presented of a study on the lubricating properties of oils thickened with the multifunctional polymeric additive IKhP-234 and containing various other antiwear additives. Tests show that thickened oils containing additives have phosphorus, sulfur, and nitrogen have a higher score index than M-8 mineral oil containing the same additives but without the polymeric additive. It is concluded that it is desirable to use additives containing phosphorus, sulfur and nitrogen atoms to prepare all-season motor oils thickened with IKhP-234 additives. References 10 (Russian).  
[219-12765]

## EFFECT OF MIXED ESTER BASED ADDITIVES ON TRIBO-CHEMICAL STABILITY OF LUBRICANTS

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 3, Mar 84 pp 22-23

NIKONOROV, Ye.M., DEMINA, L.V., SKRYABINA, T.G. and SOSULINA, L.N., All-Union Scientific-Research Institute on Oil Refining

[Abstract] To provide rocking joints that are lubricated only once with a long service life, the lubricant must have high tribo-chemical (frictional) stability. A study was made of the possibility of increasing the tribo-chemical stability of soap greases with 9:1 ratio additions of mixed pentaerythrite esters and polyacrylic acid polyesters. Since there are no special additives available to raise the tribo-chemical stability of lubricants, it was conjectured that oxidation inhibitors added to the lubricants will increase the tribo-chemical stability. Phenyl-alpha-naphthylamine, diphenylamine and mixtures of the two were added to lithium and calcium soap greases and the rates of tribo-chemical conversion were measured chromatographically. The rates of conversion varied from as low as 6.1% per hour for calcium grease containing both anti-oxidants, and 100% per hour for lithium and calcium greases containing the above additives individually with ionol. References 2 (Russian).

[219-12765]

## CLASSIFICATION OF FUELS AND LUBRICANTS FOR AVIATION TECHNOLOGY

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 3, Mar 84 pp 23-25

BEDRIK, B.G.

[Abstract] Despite the wide assortment of fuels, lubricants and special purpose liquids used in aviation, a unified classification system is still lacking. Even the state standards have contradictions. For example, GOST 10227-62 jet fuel is composed of a blend of straight-run fuels and is labeled with the letter T followed by a number, while GOST 16564-71 jet fuel, being a blend of hydrofined and straight-run fuels, is labeled simply T. GOST 12308-80 and GOST 10227-62 are labeled the same although they are different in both quality and composition. Labeling of lubricants is even more illogical. In the present work an attempt is made to work out an improved classification system for aviation-designated petroleum products that is based on product features and design factors of the equipment where it is intended to be used. References 2 (Russian).

[219-12765]

## COMPARATIVE EFFECTIVENESS OF VARIOUS PROCESSES FOR MORE EXHAUSTIVE PETROLEUM PROCESSING

Kiev KHIMICHESKAYA TEKHNLOGIYA in Russian No 2, Mar-Apr 84 (manuscript received 13 May 83) pp 3-7

BUGROV, V. A. and KHRAPUTSKAYA, L. F., ON InFOU [expansion unknown], UkSSR Academy of Sciences

[Abstract] Petroleum is an irreplaceable source of various industrial products; resources of it are limited and non-renewable and its extraction is continuously more expensive and difficult. Therefore it is necessary to develop methods for more exhaustive processing of the crude. Three different technical approaches towards more exhaustive petroleum processing were analyzed: gradual increase of the capacity of catalytic cracking over aluminum-silica or zeolite catalysts to maximum levels and increased capacity of hydrocracking; each of these catalysts was studied with and without delayed caking. Overall, the most effective method of increasing the intensity of petroleum processing was the catalytic cracking over zeolite. Along with low investment cost, it gave highest yields of motor fuel. The results showed that the greatest effect will be obtained in Siberia where energy resources are inexpensive, the lowest effect would be found in Ukraine, Byelorussia and in Baltic States. References 7 (Russian).

[229-7813]

## EFFECT OF ADDITIVES AND CATALYST STRUCTURES OF THEIR CARBONIZATION IN VAPOR CONVERSION OF LIQUID HYDROCARBONS

Kiev KHIMICHESKAYA TEKHNLOGIYA in Russian No 2, Mar-Apr 84 (manuscript received 28 Jun 83) pp 7-9

NASIROV, P., KHAMDAMOVA, E. S., KIRGIZBAYEV, T. A., ISMAILOV, T. S. and RAZIKOV, K. Kh., VNIKhTIP [expansion unknown]

[Abstract] Carbonization of catalysts lowers their activity and breaks down the contacts. A number of nickel catalysts modified with  $Al_2O_3$  and  $MgO$  was prepared and studied in vapor conversion of hydrocarbons at 500-700°C and 3.0 MPa. Addition of these dispersing-promoting agents showed specific effect on selectivity of the catalysts. Combination of  $Al_2O_3$  and  $MgO$  led to increased carbonization as well as greater yields of the products along with greater stability of the catalyst. Best results were obtained when an oxidizer was added to that mixture; thus, modified catalyst had adequate catalytic stability in gasification of hydrocarbons and no carbon deposits were noted in reactions carried out at 500-700°. Further examination of catalysts with deposited carbon particles showed that these samples in which carbon formed thread-like structures showed low resistance to carbonization.

Samples with flaky carbon deposits were more resistant because this carbon is gasified by water vapor. Figures 3; references 8 (Russian).  
[229-7813]

UDC 662.767

#### METHANE CHLORINATION OVER CARBON CATALYSTS

Kiev KHIMICHESKAYA TEKHNLOGIYA in Russian No 2, Mar-Apr 84 pp 10-11

SHATALOV, B. I.

[Abstract] It was shown that the yield of the higher products of methane chlorination was inversely related to the porosity of the catalyst. But the yield of  $\text{CCl}_4$  decreased in direct relationship to the porosity decrease. This drop in  $\text{CCl}_4$  yield was accompanied by an increase in the yield of perchloroethylene. An increase in specific surface of the catalyst from 1-2 to 400-600  $\text{m}^2/\text{g}$  accelerated synthesis of chloromethanes and the breakdown of chloroform by the reaction:  $2 \text{CHCl}_3 \rightarrow \text{C} + \text{CCl}_4 + 2 \text{HCl}$ .  
[229-7813]

UDC 661.939

#### EXTRACTION OF METHANE AND ARGON WITH LIQUID AMMONIA FROM SYNTHESIS GAS OBTAINED IN PRODUCTION OF AMMONIA

Kiev KHIMICHESKAYA TEKHNLOGIYA in Russian No 2, Mar-Apr 84 (manuscript received 26 Oct 83) pp 11-14

PYATNICHKO, A. I. and SAPRYKIN, V. L., Institute of Gas, UkSSR Academy of Sciences

[Abstract] Production of synthetic ammonia consumes about 85% of energy resources utilized in industry of mineral fertilizers. One of possible means of lowering losses of crude material and energy spent is based on recycling hydrogen and nitrogen from discharge gases into the synthesis of ammonia. A simple method is based on their absorption from circulating gas followed by recycling under high pressure into the reaction. Principal technological parameters of the absorption process were analyzed and their effect on isolation of hydrogen and inert components of discharge gases evaluated. Optimal conditions for this process were found to be: pressure - 26 MPa, average temperature of absorption - 343 K, desorption temperature - 248 K, number of theoretical plates - 7, liquid:vapor ratio - 6.5. On the basis of the production level during the 9th Five-Year Plan (7 million tons) this approach could give additional 230 thousand tons of ammonia at a saving of 230 million  $\text{nm}^3$  of natural gas. Figures 3; references 6: 1 Russian, 5 Western.  
[229-7813]

UDC 615.849.1.015.25:547.857].012.1

SYNTHESIS AND STUDY OF RADIOPROTECTIVE PROPERTIES OF SULFUR-CONTAINING PURINE AZAANOLOGS

Moscow KHIMIKO-FARMATSEVTICHESKIY ZHURNAL in Russian No 3, Mar 84 (manuscript received 18 Apr 83) pp 325-327

KRUTOVSKI KH, G. N., GORNAYEVA, G. F., VARTANYAN, L. P., KOLESOVA, M. B. and SMIRNOVA, N. V., Central Scientific Research X-ray and Radiology Institute, Leningrad

[Abstract] The high radioprotective activity of sulfur-containing compounds and low toxicity of natural metabolites containing sulfur encouraged the present search for mercapto- and mercaptoalkyl derivatives of 8-azaadenine. All of the studied 2-mercapto-8-azaadenines were obtained by cyclization of corresponding 4,5,6,-triaminopyrimidines. Results of the chemical processes, which are summarized, were confirmed by ultraviolet and PMR spectra. The resulting compounds were tested on white mice weighing 18-24 g. The best radiation protection was found using preparations with alkylated or unsubstituted mercapto-groups in the second position. Of these three, the first and second were of low toxicity: 2-thio-6-amino-8-azapurine and 2-methylthio-6-amino-8-azapurine. References 6: 2 Russian, 4 Western.  
[225-12131]

UDC 615.33.012

EXTRACTION OF ANTIBIOTICS BY MIXED SOLVENTS

Moscow KHIMIKO-FARMATSEVTICHESKIY ZHURNAL in Russian No 3, Mar 84 (manuscript received 16 Sep 83) pp 336-338

YEGUTKIN, N. L., MAYDANOV, V. V. and NIKITIN, Yu. Ye., Institute of Chemistry, Bashkir Branch USSR Academy of Sciences, Ufa

[Abstract] Individual solvents are usually used for extracting antibiotics, but synergism often occurs when mixtures are used. The present article reports on attempts to resolve this problem in extracting antitumor antibiotics variamycin and mitramycin in a mixture with erythromycin, oleandomycin,

novobiocin and lincomycin. While synergistic maxima were found with all antibiotics tested, their positions on the curves plotted varied strikingly. Further study of the solvation of antibiotics by individual solvents and by mixtures is required. Figures 4; references 9: 6 Russian, 3 Western.  
[225-12131]

UDC 661.7:547.495.9

#### SYNTHESIS OF METACID

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 2, Feb 84 pp 82-83

GEMBITSKIY, P.A., BOKSHA, L.F., BOLDENKOV, G.F., MURMYLO, S.I. and ZHUK, D.S.

[Abstract] Metacid, or low molecular weight polyhexamethylene guanidine, is an effective antiseptic and fungicide, exceeding phenol by five times and chloramine twice. This substance can be prepared by condensation of hexamethylene diamine (HMDA) with either hexamethylene dicyanamide or guanidine. The first method employs cyanogen bromide, an extremely toxic substance, while the second method requires guanidine or its hydrochloride which are not produced domestically. Synthesis of guanidine salts from dicyanodiamide and ammonium salts is relatively simple and may be carried out under conditions very similar to that of preparing metacid from HMDA and guanidine. In the present work, the processes for preparing guanidine salts and their subsequent condensation with HMDA were combined into a single process. References 3: 2 Russian, one Western.  
[204-12765]

UDC: 616-018.1-547.412.133]-085.849.19

#### ANTITOXIC EFFECT OF LASER RADIATION ON CCl<sub>4</sub>-DAMAGED HEPATOCYTES

Moscow FARMAKOLOGIYA I TOKSIKOLOGIYA in Russian No 2, Mar-Apr 84 (manuscript received 4 Apr 83) pp 49-52

KHARLAMPOVICH, S. I., POLONSKIY, A. K., MASHCHANOVA, D. D. and DREVAL', A.A.  
Moscow Medical-Stomatologic Institute imeni N. A Semashko

[Abstract] A systematic morphologic study of the effect of a helium-neon laser on intact and injured liver was undertaken. The work was performed on 160 white rats, the liver injured by administration of CCl<sub>4</sub> subcutaneously in sunflower oil at 0.12 ml per 100 g body mass twice per week for 30 days (9 injections). The hair of the abdomen was shaved over the liver and this area irradiated with a helium-neon laser for 5 minutes each day for 3 to 20 days. The animals were sacrificed in the morning on days 3, 6, 12 and 20 of the experiment. Low-intensity radiation acted transcutaneously to improve the functional activity of intact hepatocytes, had an antitoxic effect and stimulated recovery of the injured parenchyma of the liver. Six and 16 day

courses of laser therapy were most effective. Figures 2; references 14: 13 Russian, 1 Western.  
[195-6508]

UDC: 615.272:547.466.64].033

#### AGE SPECIFICS OF PHARMACOKINETICS OF POTASSIUM GLUTAMATE

Moscow FARMAKOLOGIYA I TOKSIKOLOGIYA in Russian No 2, Mar-Apr 84 (manuscript received 30 May 83) pp 58-61

ZAPADNYUK, V. I., KUPRASH, L. P., ZAIKA, M. U. and ORANSKAYA, S. A.,  
Institute of Gerontology, USSR Academy of Medical Sciences, Kiev

[Abstract] A study was made of the age specifics of the pharmacokinetics of potassium glutamate, a new substance developed at the laboratory of experimental pharmacology of the authors' institute. Potassium glutamate is a low-toxicity preparation capable of normalizing metabolic processes and activating the functions of the cardiovascular system, liver and kidneys of old animals. The experiments were performed on rabbits and female white rats, administering the preparation i/v at 25-50 mg/kg for rabbits, 50 and 500 mg/kg for rats. Blood was taken from the veins for investigation after 5, 10, 15, 30, 45 and 90 minutes. The maximum concentration of potassium in the blood plasma of the rabbits was observed 5 minutes after i/v administration of potassium glutamate, gradually decreasing to the initial level in 45 minutes for young rabbits, 90 minutes for old rabbits. The experiments showed that in order to achieve the optimal concentration of potassium in the tissues to have its antierythmic effect, older animals need different doses and dose frequencies than young animals. In the older animals, excretion occurs more slowly and total clearance is lower. Figures 3; references 13: 6 Russian, 7 Western.  
[195-6508]

## POLYMERS AND POLYMERIZATION

### LEADING, LAGGING CHEMICAL ENTERPRISES SINGLED OUT

Moscow EKONOMICHESKAYA GAZETA in Russian No 19, May 84 p 8

[Text] In the Lead

#### Novopolotsk Polimir Association

The association (director, L. Novozhilov) has created an effective system for raising labor productivity based on an integrated equipment servicing method that the collective devised in the early 1970s and the brigade form of labor organization. In the first quarter this made it possible to achieve a 5.9 percent increase in labor productivity, to include 2.2 percent in excess of the plan, and a 3.6 percent increase in production volume, as compared to the corresponding period of last year.

The profit plan was exceeded by 100,000 rubles due to an additional decrease in product cost. The plan for deliveries based on contracts and orders was completed.

#### Dzerzhinsk Orgsteklo Association

The collective of the Dzerzhinsk Orgsteklo Association (director, A. Ivchenko) initiated the sector's socialist competition for early fulfillment of the planned quotas of 1984 and of four years of the 11th Five-Year Plan. In the first quarter over 170 tons of plastics and synthetic resins, 400 tons of nitrogen fertilizers and 100 tons of phenol were produced in excess of the plan.

The plan for growth in labor productivity was exceeded by 1.7 percent. Product cost was decreased an additional 0.7 percent.

#### Kursk Khimvolokno Association

Kursk chemists (director, Ye. Yakovlev) started the 4th year of the five-year plan in outstanding fashion.

In the first quarter they produced over 300 tons of chemical fibers and filaments in excess of the plan. These products will be used to manufacture consumer goods worth over 10 million rubles. Deliveries of products based on contracts and orders will be made in their entirety. In comparison with the same



period of last year, in 3 months labor productivity grew by 3.4 percent, as compared to the planned 1.7 percent. Product cost was reduced an additional 0.5 percent.

#### Lagging Behind

##### Rustavi Khimvolokno Association

The association (director, I. Grdzeldze) fell significantly behind in its deliveries of chemical fibers to the national economy last year. Nor is it operating satisfactorily today. Its chemical fiber shortfall was 648 tons in the first quarter. The planned production cost was exceeded by 537,000 rubles in January-February.

This situation is the result of systematic violation of production conditions and large losses due to unplanned idleness of fixed capital.

##### Kemerovo Karbolit Scientific-Production Association

In the first quarter the association (director, I. Krivoruchko) worked unstably. While it fulfilled its commodity production plan by 100.5 percent and its sales plan by 100.3 percent, and while it raised its labor productivity by 0.5 percent over the planned increase, the collective was unable to fulfill deliveries of its most important chemical products.

Its shortfall was about 4,000 tons of synthetic resins and plastics, and a large quantity of molding powder and carbamide resins. The quarterly product sales plan was 89.4 percent completed with a consideration for deliveries based on contracts and on orders.

11004

CSO: 1841/240

## PRODUCTION OF POLYMERS FROM SOLIDS BY SHEAR DEFORMATION TECHNIQUE

Moscow IZVESTIYA in Russian 30 Mar 84 p 6

[Article by I. Novodvorskiy in column "Discoveries In Our Days": Polymers From Under the Press"]

[Text] On 29 March 1984 the USSR State Committee for Inventions and Discoveries registered a discovery made in the Chemical Physics Institute of the USSR Academy of Sciences by Academician N. Yenikolopov, Doctor of Chemical Sciences A. Zharov and Candidate of Technical Sciences V. Kapustyan.

All this began 18 years ago. Professor Yenikolopov was interested in how pressure affects the polymerization of organic substances existing in the solid state. Various experiments were set up on a heavy-duty hydraulic press equipped with a Bridgeman anvil---two truncated cones mounted between the planes of a press. Diploma-student of the Moscow Physical Technical Institute, Viktor Kapustyan and Aspirant Aleksey Zharov worked on this unit. Spring approached---the defense of the diploma was at hand, but there were no particular results. One had to hurry. A routine batch of organic powder was under the press. The pressure was about 30 kilobars. In the support of the Bridgeman anvil was an opening---the young researchers decided to strengthen the support by putting a steel crowbar in it as a lever. At the same time the already compressed sample was tested once more by shear deformation. Suddenly... It seems, then and also in our time, when researchers act according to plan, history is made in a subject like several unexpected discoveries of the past. This is what happened: suddenly an explosion resounded and the steel crowbar painfully knocked against his hands. However, shock instantaneously was replaced by curiosity, although the subsequent experiment was conducted by wrapping the crowbar with a rag. When the faces of the anvil were separated, an exact pellet of a substance lay on the lower surface. Analysis, which was done immediately in the laboratory, showed that complete polymerization had occurred. The rate at which the reaction took place was astonishing. The fact is that solid substances ordinarily enter poorly into chemical reactions, including polymerization reactions. As a rule, a solution or a melt of the starting material---the monomer---is used to obtain polymers.

The explosion which took place in the Chemical Physics Institute Laboratory seriously shook up the old views on the polymerization of solids. The formula

"pressure plus shear" was born, and planned research was begun which gave interesting results. It appeared that, according to the new technology, solid monomers (including those from which polymers had not been successfully obtained previously) were converted into polymers at enormously rapid rates, by dozens and hundreds of times exceeding the values with which chemists were used to dealing when working with liquids. It also became possible to obtain polymers from liquids at ordinary temperatures by the magic formula "pressure plus shear". Liquids are frozen, and then this "ice" is converted into polymers by subsequent compression and shear deformation.

The most important regularity of the polymerization reaction under these conditions is that the course of the reaction depends on the shear deformation value. At the same time the discoverers established that this regularity also can be extended to other chemical processes, for example, to the synthesis of organic compounds or decomposition reactions of substances.

The discovery and its subsequent development in the work of Soviet and foreign scientists established the bases for a new branch of chemistry---the chemistry of deformation processes.

IZVESTIYA recently, in an article "Don't throw away old galoshes", told about a new promising technology for crushing materials produced on the basis of this discovery. It already serves the people.

12410

CSO: 1841/241

# LIGHT SENSITIVITY OF CERTAIN HYDROPHOBIC COPOLYMER PARTICLES DISPERSED IN POLYVINYL ALCOHOL

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 2, Feb 84 (manuscript received 24 Aug 82) pp 479-480

SAVESTENKO, G.N., YERMOLENKO, I.N. and KOSHEVAR, V.D., Institute of General and Inorganic Chemistry, Belorussian SSR Academy of Sciences

[Abstract] An ultraviolet light-sensitive material was prepared consisting of a substrate of glass, paper or film covered with an emulsion of particles of nonylmethacrylate-methacrylic acid copolymer or polyacrylonitrile-itaconic acid copolymer suspended in 5% aqueous polyvinyl alcohol. The material gave satisfactory fog-free images at  $2.5 \times 10^{17}$  quanta/(cm<sup>2</sup>·sec) UV exposure followed by photographic treatment with developers and reducers. References 2 (Russian). [201-12765]

UDC 678.744.325.01:66.095.2:539:539.3

# EFFECT OF POLYMERIZATION CONDITIONS ON MECHANICAL AND MOLECULAR PROPERTIES OF PMMA

Moscow PLASTICHESKIYE MASSY in Russian No 3, Mar 84 pp 5-6

SAMARIN, A. F., SAFONOVA, N. N., SOROKINA, G. N., RADBIL', T. I. and SHTARKMAN, B. P.

[Abstract] Forepolymer characteristics have a distinct influence on polymerization processes and resulting polymer properties. Stability of the forepolymer, which had long been problematical, is the topic of the present study. Polymethylmeth-acrylate (PMMA) was produced at 140°C, then further polymerized with 20% SFP organic glass as a forepolymer. Results indicated that the molecular weight distribution of the forepolymer had a key impact not only on polymer properties in the glass-forming and viscous-flow states, but also on polymer behavior in a highly elastic state. The forepolymer made greater stretching possible in producing objects with complex configurations. Figure 1; references 4: 2 Russian, 2 Western. [228-12131]

## SYNTHESIS AND ANTISTATIC PROPERTIES OF QUATERNARY AMMONIUM SALTS BASED ON BISPHENOLS

Moscow PLASTICHESKIYE MASSY in Russian No 3, Mar 84 pp 6-10

VASILENOK, Yu. I., LAGUNOVA, V. N., RYABOV, V. D., KHROMOVA, N. V. and SHCHERBAKOV, A. A.

[Abstract] Quaternary ammonium salts, as derivatives of bisphenols, can be expected to have a stabilizing effect on polymer materials along with antistatic properties. The present article reports on antistatics prepared from diphenylol-propane, 2,2-bis(o-cresyl)propane, 1,1-diguaiacycylethane, 1-phenyl-1,1-bis(hydroxyphenyl)ethane and bis(hydroxyphenyl)sulfone, which converted into corresponding Mannich bases. Then their effect was assessed on high- and low-pressure polyethylene, polypropylene and block polystyrene of production grade, and experimental samples of PMMA. Various antistatic properities were recorded for specific combinations of the additives and the polymers. Antistatic effects were higher in high-pressure polyethylene than in low-pressure polyethylene, and the polyethylene structures themselves were altered by the antistatic additive. Most of the tested quaternary ammonium salts based on bisphenols were found to be good antistatic compounds as well as stabilizers. Figure 1; references 11 (Russian). [228-12131]

## RETICULATED COPOLYMERS OF DIVINYL ESTER OF HYDROQUINONE AND ACRYLATES

Moscow PLASTICHESKIYE MASSY in Russian No 3, Mar 84 pp 10-12

TSARIK, L. Ya., VOKINA, O. G., SKOBEYEVA, N. I., EDEL'SHTEYN, O. A. and KALABINA, A. A.

[Abstract] The divinyl ester of hydroquinone has been suggested as a bonding agent with monovinyl monomers. The present article reports on radical three-dimensional copolymerization with acrylates and the resulting chromatographic sorbents. Chemical procedures and data analysis are summarized, and the results of argon heat desorption and mercury porometry tests described. The resulting copolymer was less active than acrylates, and followed the order of activity methylmethacrylate < methylacrylate < butylacrylate < acrylonitrile. A typical feature of the three-dimensional copolymerization was the decline in reaction speed throughout the entire process with simultaneous increase of ester content in the copolymer. The beta-polymer, with unreacted secondary vinyl bonds, accumulated and entered into copolymerization, leading to branched microparticles or microgels. Unreacted double bonds of divinyl ester and methylmethacrylate constituted 20-60% of the ester links in the copolymers. Kinetic studies in the reactive mass and in such solvents as

nonane, isoamyl alcohol and DMMA showed that the cross-linking agent should be 20%, and the pore-forming agent 60%, of the total reactive mass. The porous copolymers produced by such a process can be used as polar sorbents in gas chromatography to separate polar and non-polar substances at 303-535 K. Figures 3; references 9: 7 Russian, 2 Western.  
[228-12131]

UDC 678.766-416:631.842.4

#### REACTION OF POLYIMIDE FILM WITH AMMONIUM NITRATE MELT

Moscow PLASTICHESKIYE MASSY in Russian No 3, Mar 84 pp 16-17

STRIZHEVSKIY, I. I., MOSHKOVICH, Ye. B., NOVIKOVA, O. S., KOSINOVA, L. I., TUMANOVA, V. I. and GORELOVA, G. K.

[Abstract] Polyimide films are highly useful for producing membranes that measure slight pressure changes. The present article reports on study of the oxidizing effect of ammonium nitrate on such films at high temperature, and also considers the thermal stability of ammonium nitrate in the presence of polyimide film. This decomposition was measured in glass vessels to which ground film was added. Data indicated that the film did not affect decomposition at all. Rather, decomposition of ammonium nitrate with increasing heat was a function of self-catalytic action in the compound itself as nitric acid formed. Derivatograms indicated the start of thermal decomposition at 225° and its maximum rate at 250°C. The polyimide film was found to retain its weight in ammonium nitrate, but the film lost some elasticity. Figure 1.  
[228-12131]

UDC 678.5.067.5.019.391

#### EFFECT OF CLIMATIC FACTORS ON PROPERTIES OF GLASS-FILLED COMPOSITIONS

Moscow PLASTICHESKIYE MASSY in Russian No 3, Mar 84 pp 23-24

KRUPENINA, L. L., SHCHEGLOV, L. L., SMIRNOVA, Z. A. and STRAMNOVA, A. B.

[Abstract] Pressed material items with increased useful life because of reinforcing additives are used in construction and electrical equipment. Glass fibers based on alumoborosilicate with a "paraffin emulsifier" have high technical parameters, but low adhesion to polymers, thus causing deterioration in use. New lubricating agents that leave less porosity of the polymer coating at the contact point and greater resistance to thermal and thermooxidation destruction were sought by the present authors. Aggressive environments also lead to structural changes and loss of durability through physical and chemical processes. Data show such changes to have extreme impact in destructive tension during bending and in the tangent of dielectric loss angle.

Phenol resins were found to provide greater durability than paraffin variants. Physiomechanical and electrical properties were estimated to be retained for 25 years with the newly developed glass-filled compositions, compared to 10 years with earlier versions. References 4 (Russian).  
[228-12131]

UDC 678.84.01:66.085.3:537

#### EFFECT OF REACTOR RADIATION ON ELECTRICAL PROPERTIES OF LIQUID DIELECTRIC PFMS-6 IN STATIC SYSTEM

Moscow PLASTICHESKIYE MASSY in Russian No 3, Mar 84 pp 24-26

KNIZHNIK, Ye. I., RYAZANOV, K. B., and PEDCHENKO, K. S.

[Abstract] Satisfactory radiation resistance of liquid dielectrics determines normal operation of electrotechnical facilities affected by powerful ionizing irradiation. Polyphenols have been shown to be the most durable, but their shortcomings include a significant dependency of viscosity on temperature and dielectric properties on frequency. As an alternative, the authors studied organic silicon liquids under the effect of radiation. Polyphenylmethylsiloxane (PPMS) liquids that were also tested were found to change less than dimethylsiloxanes, with less gas emissions. The present article reports on study of PPMS-6 liquid with molecular weight of  $\approx 1500$ , boiling point (at 130-260 Pa pressure) over  $350^{\circ}\text{C}$  and congealing temperature of  $-10^{\circ}\text{C}$ . Radiation at  $300^{\circ}\text{C}$  until an integral neutron flow and gamma-quantum of  $1 \cdot 10^{16} \text{ cm}^{-2}$  were reached brought a 60% drop in molecular weight of PPMS-6 through thermodestruction. Loss of dielectric permeability with increasing temperature was typical for polyorganosiloxanes. The energy of the corresponding activation process decreased from 272.4 to 197 kilojoules/mole due to weakening of intramolecular reaction following depolymerization of the polymer. Figures 3; references 15: 12 Russian, 3 Western.  
[228-12131]

UDC 678.743.21.026.3

#### COATINGS OF POLYVINYLFLUORIDE ORGANODISPERSIONS

Moscow PLASTICHESKIYE MASSY in Russian No 3, Mar 84 pp 35-37

BUGORKOVA, N. A., KOCHKINA, L. G. and IVANOVA, L. I.

[Abstract] Due to the small amounts of fluorine in polyvinylfluorides (PVF), such coatings have less thermal durability and chemical resistance than others in use, but surpass coatings of PVC, polyethylene and polyacrylonitrile, among others, in those properties. They also have low mechanical durability and useful life. The present article reports on processes for obtaining PVF

coatings that were synthesized in halogen-containing media or in aqueous-organic media to obtain higher molecular weights than the common 10,000. Attributes of compounds obtained by aqueous emulsion techniques are summarized. Inert solvents such as ethyl alcohol contributed little to increasing viscosity of the polymers produced. In a latent solvent such as dimethylphthalate (DMP) and in a mixture of DMP with inert solvents, thicker coatings (30-60 mcm) were produced. Quality coatings with high adhesion and mechanical, and use, parameters require coalescence of particles throughout the coating and total elimination of the solvent. This was achieved by supplemental heat treatment at 225-250°C for 10 and 3 minutes, respectively. The innovations in the described process can be useful in producing coatings 100-300 mcm in thickness that are used as anticorrosion coatings of chemical equipment, pipelines and tank trucks for aggressive liquids such as hydrochloric acid, alkali, acetone and gasoline. Figures 2; references 6: 2 Russian, 4 Western. [228-12131]

UDC 678.01:541.1

#### RHEOLOGICAL PROPERTIES OF THERMODYNAMICALLY COMPATIBLE POLYAMIDE MIXTURES OBTAINED BY DIFFERENT METHODS

Kiev KHIMICHESKAYA TEKHNLOGIYA in Russian No 2, Mar-Apr 84 (manuscript received 17 Jun 83) pp 29-31

SUPRUN, N. P. and ROMANKEVICH, O. V., Kiev Technical Institute

[Abstract] The goal of the present work was to study the effect of the method of mixing of thermodynamically compatible polymers on their rheological properties. Two granular and powdery materials were used: PA6 and PA54, mixing mechanically these powders in suspension and the granular material on a worm milling machine. The results showed that the method of mixing has a definite effect on the following properties: viscosity, expansion of the extruded material and morphological structure of the mixtures formed. The mixing methods based on different conditions determine the range of transitional intercomponent layer, which affects both the morphology and rheological properties of such systems. Figures 3; references 12: 10 Russian, 2 Western. [229-7813]



## LOCAL POLYMERIZATION OF ACRYLAMIDE IN GELATIN MATRIX WHEN EXPOSED TO HELIUM-NEON LASER

Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol 50, No 3, Mar 84  
(manuscript received 18 Apr 83) pp 250-254

LUTOSHKIN, V. I., VOLKOV, S. V. and BOTSMAN, A. V., Institute of General and Inorganic Chemistry, UkSSR Academy of Sciences, Kiev

[Abstract] Frequency-contrast, helium-neon laser holography and IR spectroscopy were used to study the local polymerization of acrylamide in a gelatin matrix. Methylene blue dye was used as a sensitizer and triethanolamine as a reducing agent. On comparing an irradiated gelatin-acrylamide film to an equivalent one which had not been irradiated, a decrease in the intensity of the  $870\text{ cm}^{-1}$  peak was noted, corresponding to a decrease in acrylamide monomer content after irradiation. Hologram formation was not found to be due to the presence of chromium. Maximal diffraction effect was achieved after 120 seconds of exposure to the laser. The maximum beam convergence angle for local polymerization was  $60^\circ\text{C}$ , while higher angles gave total polymerization. A resolving power of 1600 lines/mm was obtained. Figures 5; references 12: 7 Russian, 5 Western.  
[217-12126]

UDC 678.664:536.63

## STRUCTURE AND PROPERTIES OF CARBON BLACK FILLER IN SEGMENTED POLYESTER URETHANE

Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol 50, No 3, May 84 (manuscript received 3 May 83) pp 322-326

KERCHA, Yu. Yu., KUZ'MINA, V. A., LAPTIY, S. V., GONCHAROVA, L. B., CHUMIKOVA, G. N. and GREKOV, A. P., Institute for the Chemistry of High Molecular Weight Compounds, UkSSR Academy of Sciences, Kiev

[Abstract] A study was conducted of the structure and properties of filled segmented polyester urethane (PEU), synthesized in a two-stage process from oligohydroxytetramethylene glycol, 4,4'-diphenylmethane diisocyanate and 1,4-butanediol. Grade PM-100 carbon black was added at the second stage; carbon contents of 1, 3, 5, 10 and 30% were produced. At 1% carbon, somewhat lowered glass transition temperatures were observed, indicating increased mobility in both elastic and rigid segments. Carbon contents of 1-5% led to decreased PEU solution viscosity, due to lower polymer molecular mass. Changes in the IR spectra of samples which were 3 or 5% carbon indicated decreased urethane self-association and the appearance of urea groups. Glass transition temperatures and pour points were greater than those of the 1% samples but did not exceed those of PEU without carbon. Decreased glass transition temperatures and pour points in the 10 and 30% samples, as well as further changes in the IR, indicated strong increases in the segmental mobility of

both elastic and rigid components. The IR also indicated that the introduction of carbon black causes significant changes in the hydrogen bonds of PEU. Figures 2; references 11 (Russian).  
[217-21126]

UDC: 678.742.2-134.442.2.02:66.095.262

#### COPOLYMERIZATION OF ETHYLENE WITH VINYL ACETATE INITIATED BY 'ACTIVE' POLYSTYRENE

Moscow PLASTICHESKIYE MASSY in Russian No 2, Feb 84 pp 12-13

KUZNETSOVA, T. A., KONOVALENKO, V. V., DUNTOV, F. I., GRADOBOYEVA, G. P., and GOL'DENBERG, A. L., KARASEV, A. N., GEBAUER, M., BAUMANN, Kh. and IVANCHEV, S. S.

[Abstract] A study was made of the primary kinetic regularities of copolymerization of ethylene with vinyl acetate, the composition and certain properties of the products obtained in the presence of polystyrene with terminal peroxy groups. The composition of the copolymers formed in the presence of active polystyrene was found to depend on the composition of the reaction mixture, molecular mass of macroinitiator and copolymerization conditions. When 0.9 to 3.0% macroinitiator was used with molecular mass 37,000-100,000 at 110-130°C and 160 MPa pressure, copolymers were formed containing up to 3.6% polystyrene. This is sufficient to modify the copolymers of ethylene with vinyl acetate. Increasing the molecular mass of macroinitiator helps to increase the content of polystyrene in the copolymerization products. The new modified copolymers are more elastic than structured polyethylene. Their strength is greater not only than that of structured ethylene-vinyl acetate copolymer, but also structured high pressure polyethylene. Figures 2; references 3 (Russian).  
[212-6508]

UDC: 678.06.019.32

#### RAPID DETERMINATION OF ATMOSPHERIC RESISTANCE OF POLYMER MATERIALS

Moscow PLASTICHESKIYE MASSY in Russian No 2, Feb 84 pp 13-15

MELKUMOV, A. N., PRUTKIN, V. P., TAVSHUNSKAYA, L. I. and TETENEVA, S. S.

[Abstract] The method of testing polyethylene under atmospheric conditions includes preparation of specimens of the material with preliminary deformation by uniaxial extension of a standard specimen to a level near the recrystallization stress, exposure of the specimens under natural conditions along with undeformed specimens. The method allows accelerated testing under natural conditions. The use of artificial weather apparatus can additionally reduce the testing time. Figures 2; references 5 (Russian).  
[212-6508]

UDC: 678.643'42'5:678.029.65

SELF-CURING UNSATURATED CYCLIC AMINOEPOXY RESINS AND FLAME-RESISTANT COMPOSITIONS BASED UPON THEM

Moscow PLASTICHESKIYE MASSY in Russian No 2, Feb 84 pp 15-16

MUSTAFEYEV, A. M., GUSEYNOV, M. M. and BABAYEV, A. I.

[Abstract] A study was made of the synthesis of unsaturated cyclic amino-epoxy resins having reactive epoxy groups, tertiary nitrogen and double carbon-carbon bonds in their structure. These resins allow the production of polymers with predetermined properties. The results affirmed that the reaction of 1, 9-diamino-bis-cyclo-2,7-pentene with epichlorohydrin forms a resin of known structure illustrated in the article. The aminoepoxy resins obtained are capable of self-curing, occurring as a result of interaction of the epoxy groups with residual secondary amino groups, and also due to polymerization of oligoepoxides under the influence of tertiary amino groups. Increasing holding time of specimens in heat treatment causes complete disappearance of epoxy groups in several absorption band areas characteristic for the double bond, present in the IR spectrum of the uncured resin. The aminoepoxy groups thus cure both at the epoxy ring and at the double bond. Figure 1; references 7 (Russian).

[212-6508]

UDC: 678.643'42'5:665.452

EPOXY RESINS BASED ON SHALE ALKYLRESORCINOLS

Moscow PLASTICHESKIYE MASSY in Russian No 2, Feb 84 pp 16-18

NURKSE, Kh. Kh.

[Abstract] Alkylresorcinols form the major useful fossil material of the Estonian SSR in addition to liquid and gaseous fuel products. Typical resins are briefly described. They include type ARE-1-20 (the old type ZIS-1). Areas of application are briefly noted. ARE-1-12 is used as a binding material in the production of construction materials. There is also interest in their use as a modifying agent. Figures 2; references 7 (Russian).

[212-6508]

UDC: 678.742.2.01:539:66.085.3

PREDICTION OF POLYETHYLENE DURABILITY UPON EXPOSURE TO  $\gamma$  RADIATION

Moscow PLASTICHESKIYE MASSY in Russian No 2, Feb 84 pp 18-20

BELOUSOVA, M. V., SMIRNOV, V. S., KUSHNIKOV, I. Ye., MAKLAKOV, A. I.,  
POTAPOVA, I. V., ROMANOV, B. S. and RUMYANTSEV, D. D.

[Abstract] Bombardment of polyethylene with  $\gamma$  radiation initiates destruction and cross linking processes leading to structural and physical conversions and deterioration of operational properties. This article studies methods of predicting the durability of polyethylene upon exposure to  $\gamma$  radiation using pulsed NMR and low-angle x-ray studies. An example of calculation of the service life of high pressure polyethylene is presented. A material exposed at room temperature to  $\gamma$  radiation at 0.2 MGr for 6 months is described. Figures 3; references 5: 3 Russian, 2 Western.

[212-6508]

UDC: 678.745.2:546.171.5

EFFECT OF HYDRAZINE SALTS ON AMINOPLAST

Moscow PLASTICHESKIYE MASSY in Russian No 2, Feb 84 pp 22-23

MIKHAYLOVA, N. A., KULIKOVSKAYA, S. G., KALMYKOV, V. V. and NIKITIN, Ye. G.

[Abstract] Results are presented from a study of the effect of hydrazine salts on aminoplastics in the process of etching. Conditions assuring high quality metal coatings on aminoplastics are determined. The effect of hydrazine salts on aminoplastics indicates that etching is a diffusion-kinetic process. Etching conditions are established to produce high quality metal coatings on the plastic surfaces. Figures 3; references 4 (Russian).

[212-6508]

UDC: 678.743.22:543.876:541.12.036

ESTIMATE OF THERMAL STABILITY OF CAST MATERIALS BASED ON RIGID PVC

Moscow PLASTICHESKIYE MASSY in Russian No 2, Feb 84 pp 26-28

SIMONOV-YEMEL'YANOV, I. D., KULEZNEV, V. N., GUSTOVA, Ye. V., MAKAROV, V. L.,  
BELOVA, L. I., POZHIDAYEVA, E. A. and USHAKOVA, N. B.

[Abstract] The problems of estimation of thermal stability of PVC and creation of molded materials with high thermal stability are pressing. With a fixed PVC composition, development of optimal technology for production of

quality molded products requires data on the time during which the material remains unchanged at a given temperature, pressure or other type of environmental factor. There are two main groups of methods of estimating the thermal stability of PVC, static and dynamic methods. The rheologic method, under proper conditions, rather rapidly and with minimum loss of material determines the quality of the material and its suitability for treatment by molding under pressure, allowing the process of molding to be designed considering the thermal stability of the material. Figures 2; references 14: 11 Russian, 3 Western.  
[212-6508]

UDC: 678.743.22-462.029.42

#### GLUEING OF PVC PIPES WITH AN OVERLAP

Moscow PLASTICHESKIYE MASSY in Russian No 2, Feb 84 pp 28-31

OTSTAVNOV, A. A.

[Abstract] Studies were performed of overlap glueing of medium diameter PVC pipe and the operating properties of the glue joints. The results of the experiments indicated that the strength of adhesive joints of PVC pipe does not decrease even when tensile stresses are created at up to 80% of the proportionality limit for nonplasticized PVC during the process of glueing. The high tensile stresses are apparently rapidly relaxed after the elements are brought together and have practically no influence on the shear load during later testing. Figures 2; references 7 (Russian).  
[212-6508]

UDC 661.879

BEHAVIOR OF VOLATILE RADIOACTIVE IMPURITIES DURING FLUORIDATION OF URANIUM-CONTAINING MATERIALS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 2, Feb 84 (manuscript received 10 Mar 82) pp 254-258

GALKIN, N.P., KHOMYAKOV, V.I. and KHARIN, V.F.

[Abstract] Results are presented of a study on the behavior of micro impurities of plutonium and gamma-active isotopes of ruthenium, cerium, niobium and zirconium during fluoridation of uranium oxide and sub-oxide as recovered from spent nuclear fuel cells, and the causes of incomplete distillation of plutonium and radionuclides are examined. As the capacities of water-water type nuclear power reactors grow, the need for fast recycling of uranium becomes more acute. This study shows that high purity uranium hexafluoride can be obtained by employing physical and chemical methods such as filtration, sorption, condensation and fractionation making use of the volatility differences of the impurities to remove them. By combining the filtration and cooling steps, it is possible to separate  $UF_6$  from dust and fluoride impurities which condense and become entrapped in the filter. References 7: 6 Russian, one Western.  
[201-12765]

UDC 66.026.095.268

RADIATION TREATMENT OF HEAVY DUTY PIPES WITH ELECTRON BEAM

Kiev KHIMICHESKAYA TEKHNLOGIYA in Russian No 2, Mar-Apr 84 (manuscript received 31 Mar 83) pp 31-33

OMEL'CHENKO, S. I., STRAKOVSKAYA, R. Ya., SHLAPATSKAYA, V. V., P'YANKOV, G. N., MIRYANIN, V. N. and KRIVOSHEIN, G. P., Institute of High Molecular Compounds Chemistry, UkSSR Academy of Sciences

[Abstract] High energy electron beams are used for irradiation of polymer materials and products made from them. One of the tasks of radiation technology is to provide uniformly distributed absorption of radiation dose

both on the surface and in-depth. This is achieved by rotating the products under a beam and by layered radiation. Theoretical calculations were carried out for a continuous irradiation of large, heavy duty plastic pipes permitting determination of necessary radiation exposures. On the basis of preliminary experimental dosimetry data on the in-depth distribution of radiation dose, and dose exposure per revolution of the target, one can calculate effectively proper parameters for irradiation. Figures 2; references 3 (Russian). [229-7813]

UDC 542.61

#### EXTRACTION OF URANIUM WITH HEXANOIC ACID IN PRESENCE OF ORGANIC BASES

Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol 50, No 3, Mar 84 (manuscript received 4 Feb 83) pp 270-272

SUKHAN, V. V., GORLACH, V. F. and YAKIMENKO, L. N., Kiev State University imeni T. G. Shevchenko

[Abstract] A study was conducted of the extraction of uranium (IV) by a chloroform solution of hexanoic acid with or without the addition of pyridine, 2-aminopyridine, benzylamide or o-phenanthroline. Uranium concentration was determined with arsenazo 1. In the absence of amines, 1 M hexanoic acid completely extracted  $10^{-3}$  M uranium in the pH interval from 4 to 7. The additives widened the pH plateau or maximal extraction. The presence of  $UO_2Am_2A_2$ , where Am is the amine additive and A the anion of hexanoic acid, was indicated. Benzylamide was the most effective synergetic additive. The extraction of calcium by hexanoic acid and benzylamide was sharply lower than that of uranium, while iron, titanium and zirconium gave somewhat lower extractions at alkaline pH's and higher extraction at acidic pH's. Thus, uranium could be separated from calcium at pH 4.5-5.5. To separate uranium from iron, titanium and zirconium, the most effective masking agent was oxalic acid. An extraction scheme for these separations was developed. Figures 2; references 8: 4 Russian, 4 Western. [217-12126]

## EFFECTS OF ARGON IONS ON LEAD GLASS EMISSION

Leningrad FIZIKA I KHIMIYA STEKLA in Russian Vol 10, No 1, Jan-Feb 84 (manuscript received 24 Mar 83) pp 104-106

LEONOV, N.B., TYUTIKOV, A.M., MURASHOV, S.V., CHEREZOVA, L.A., PRONIN, V.P. and SHAKALOVA, T.K., State Optical Institute imeni S.I. Vavilov, Leningrad

[Abstract] An evaluation was made of the effects of argon ions ( $0.5-1 \text{ mA/cm}^2$ ;  $0.5-3 \text{ keV}$  ion energy;  $10-20 \text{ min}$  bombardment) on the emission characteristics of lead glass in terms of the coefficient of secondary electron emission (CSEM). Argon ions altered the surface of the glass to such an extent that subsequent reduction prevented diffusion of Na, K, C, and other elements to the surface. The latter change led to an increase in the CSEM. In addition, the formation of a layer with a large  $Z_{\text{eff}}$  value beneath the surface layer potentially contributed to the increase in the CSEM due to electron reflection. Argon bombardment of reduced surfaces modified the (preformed) formed surface in such a manner as to somewhat decrease the CSEM. Figures 2; references 3 (Russian).  
[237-12172]



UDC: 6.00.4.8

SYNTHESIS AND DETERMINATION OF AREAS OF APPLICATION OF AROMATIC LINEAR KETALS

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA  
TEKHNOLOGIYA in Russian Vol 27, No 2, Feb 84 (manuscript received 11 May 82)  
pp 166-168

LYCHKIN, I. P., LITVINOVA, T. V., KONTSOVA, L. V. and PETYKHIN, Yu. M.,  
Department of Technology of Recovery of Side Products and Petrochemical  
Production Wastes, Voronezh Institute of Technology

[Abstract] The authors synthesized dioctyl- and diallylacetophenone by condensation of acetophenone ketals with octyl and allyl alcohols. The reaction of diethylacetophenone ketal synthesis was performed with azeotropic distillation of water liberated in the presence of a catalyst. Diallylacetophenone ketal was synthesized in the presence of p-toluene sulfoacid with toluene as the azeotrope former. The experimental plasticizers were found to improve the plastoelastic properties of mixtures, the elastic and cold resistance properties of vulcanizers. This indicates the possibility in principle of their use as raw rubber plasticizers. Diallylacetophenone ketal has the greatest plasticizing effect. References 2 (Russian).  
[221-6508]

UDC: 678.4.01:678.762:678-13

STUDY OF PROPERTIES OF ETHYLENE-PROPYLENE RAW RUBBERS MODIFIED BY ACRYLONITRILE

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA  
TEKHNOLOGIYA in Russian Vol 27, No 2, Feb 84 (manuscript received 27 Nov 81)  
pp 239-242

FRENKEL', R. Sh., ALEKSEYEVA, L. N., OGREL', A.M. and KAKHRAMANOV, N. T.,  
Department of Rubber Technology, Volgograd Polytechnical Institute

[Abstract] Ethylene-propylene raw rubber containing various quantities of graft acrylonitrile was studied. The physical-mechanical properties of vulcanizates were found to vary directly as a function of the percent content of graft CN groups in the ethylene-propylene raw rubber molecule. Figures 3; references 3 (Russian).  
[221-6508]

SYNTHESIS AND PROPERTIES OF GRAFT POLYMERS OF POLYPROPYLENE WITH  
4-VINYLPYRIDINE

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA  
TEKHOLOGIYA in Russian Vol 27, No 2, Feb 84 (manuscript received 8 Jun 82)  
pp 235-238

NABIYEVA, A. M., MUSAYEV, U. N., KURBANOV, Sh. A., VLASOV, A. V. and  
TSETLIN, B. L., Department of Synthetic Polymer Chemistry, Tashkent State  
University imeni V. I. Lenin, Central Scientific Research Institute of the  
Cotton Industry

[Abstract] Graft polymerization of 4-vinylpyridine was performed from the  
vapor phase with polypropylene textile materials (mats) under the influence  
of  $^{60}\text{Co}$  irradiation. The 4-vinylpyridine monomer was distilled under a  
vacuum before the experiments, bp  $54^{\circ}\text{C}$  (266.6 Pa),  $n_D^{20}$  1.5452,  $d=0.9661$   
 $\text{g/cm}^3$ . The experiments demonstrated the variation in yield of graft polymer  
as a function of irradiation duration. An increase in radiation dose,  
either by an increase in dose rate or by an increase in dose time, leads to  
an increase in the yield of the graft polymer. Graft polymerization of  
4-vinylpyridine with polypropylene is determined to occur in the kinetic  
area with no diffusion delays, since the initial rate of radiation graft  
polymerization is proportional to the square root of radiation dose rate.  
Figures 4; references 5 (Russian).  
[221-6508]

WATER TREATMENT

UDC 628.31:648.18]:628.344

OXIDATION OF SURFACTANTS IN REDUCING COLORATION OF SEWAGE WATER USING HYDROGEN PEROXIDE IN PRESENCE OF CATALYST

Moscow KHIMIKO-FARMATSEVTICHESKIY ZHURNAL in Russian No 3, Mar 84 (manuscript received 25 Nov 82) pp 356-360

FAYNGOL'D, Z. L., ZAV'YALOVA, Ye. V., KARPUKHIN, V. F. and DGVEPADZE, R. V., All-Union Scientific Research Institute for Antibiotics, Moscow

[Abstract] Sewage of the pharmaceutical chemical industry such as surface-active substances (SAS) and coloring agents is oxidized with difficulty during biological purification processes. Hydrogen peroxide in combination with certain metals has been successful in such purification, and the present article reports on such purification and decoloration with laboratory and natural sewage using the catalysts  $\text{FeSO}_4$ ,  $\text{Al}_2(\text{SO}_4)_3$  and  $\text{CuSO}_4$ . In model tests, anionic, nonionogenic and cationic synthetic SAS were used. The catalysts increased destruction of the SAS types markedly, and resulted in the formation of suspensions and precipitates in the sewage. The catalytic  $\text{H}_2\text{O}_2$  process is recommended as a prepurification procedure. Aluminum sulfate was more effective than iron sulfate in decoloration. Changes in pH by adding acids and alkalis brought immediate changes in coloration. The duration of contact was also an important factor. The  $\text{H}_2\text{O}_2$  method of local purification is particularly recommended where hydrogen peroxide is already used in the plant's pharmaceutical production. Figures 5; references 10: 4 Russian, 6 Western.  
[225-12131]

## INDUSTRIAL TESTING OF PRECIPITATE THICKENING AT STATION FOR CLARIFICATION OF SLIGHTLY CLOUDED WATER

Moscow VODOSNABZHENIYE I SANITARNAYA TEKHNIKA in Russian No 3, Mar 84 pp 25-26

PROSHIN, E. A., candidate of technical sciences, RAKHAMIMOV, V. D., engineer and PAVLOV, G. D., candidate of technical sciences, All-Union Scientific Research Institute for Water Supply, Sewers, Hydrotechnical Installations and Hydrogeological Engineering

[Abstract] The title institute has developed two radial sewage thickeners, 12 m in diameter, holding 345 m<sup>3</sup> of sewage for treatment. The linear rate of revolutions at the outer edge was 0.044 m/sec, which is 1.8 times the maximum permissible rate. Precipitated water is removed by a floating sleeve at a depth of 0.12-0.15 m, and a photoelectric signal measures the water level. Laboratory tests showed that the accelerated rate of revolutions seriously reduced the effectiveness of the thickening process. Both flat and triangular stirring blades were used in the tests. Where the blades were less than 0.09 m apart, the sewage was moved poorly between the blades; where it exceeded 0.18 m, part of the sewage was not mixed at all. These and other initial deficiencies were corrected, and the eventual design has been put to broad use in Soviet sewage treatment plants. The economic effect amounts to reducing water use by 70-90%, reducing volume of solid waste in the accumulators, and lower construction costs for pipelines to transport precipitates to the accumulators. Figures 5.  
[227-12131]

UDC 628.33:628.35

## NEW PROCEDURE FOR BIOLOGICAL PURIFICATION OF SEWAGE

Moscow VODOSNABZHENIYE I SANITARNAYA TEKHNIKA in Russian No 3, Mar 84 pp 27-28

TUROVSKIY, Yu. I., engineer, Moscow Oblast Sewer System and SOROKIN, G. G., engineer, Ufa Purification Facilities

[Abstract] Procedures for biological purification of water using active sludge have such shortcomings as excess suspended materials and consequent overburdening of aerators. The authors propose new technological procedures for such purification in which more than 100% needed active sludge is directed into the preaerator and the mixture is removed at least twice daily. The equipment and procedures used are diagrammed and described. After laboratory tests and field tests in Ufa, an empirical formula for the quantity of active sludge feed to provide the desired excess amounts in pre-aeration was developed. The procedure makes it possible to reduce the volume of aerobic stabilizers and the sludge space required by 20% while at the same

time permitting additional load levels at the purification installation. Use is simplified and energy-use is reduced. Figures 3; references 4 (Russian). [227-12131]

UDC 628.54:661.525

#### CONCENTRATION OF INDUSTRIAL WASTE WATERS BY ELECTRODIALYSIS

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 2, Feb 84 pp 98-100

KRASNOVA, T. A., SALDADZE, K.M., KUTERGIN, V.R., VALOV, V. G. and FEDOSEYEVA, N.M.

[Abstract] Known chemical and physical chemical methods for leaching out mineral pollutants from industrial waste waters are costly, take much time, require additional reagents and either desalinated water or high energy. One of the most promising methods for treating industrial effluents is electro-dialysis by which it is possible to obtain both desalinated water and concentrated solutions of valuable components. A study was made to develop a process for leaching out and concentrating impurities contained in effluents resulting from ammonium nitrate production using a series built electro-ionite desalinators EOU-NIIPM-25. Recommendations are made for rebuilding this unit so that it can operate continuously to provide desalinated water, which can be recycled, and also a concentrate. References 6: Russian. [204-12765]

UDC 628.54

#### TREATMENT OF INDUSTRIAL EFFLUENTS FROM CHELEKEN CHEMICAL PLANT

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 2, Feb 84 pp 100-101

SHENKER, M.A. and GOBERMAN, M.S.

[Abstract] Recent use of new oil sources, effluents from Cheleken industries, and waters from worked-out oil wells have increased the contamination of industrial water entering plants with oil products and suspended matter resulting in contamination of activated charcoals used to leach out iodine from crude oil and further polluting effluents entering the Caspian Sea. Laboratory and pilot plant studies were carried out on treatment of effluent containing chloride, bromide, iodide, sulfate, magnesium, strontium, and other ions, naphthenic acids and suspended matter in a non-pressurized rapid filtration system using polyacrylamide as flocculant and sand and anthracite powder as filter medium. The amount of water used to clean the filters is 2% of the total water treated, being one-fifth of that used in pressurized rapid filtration systems. Figures 3. [204-12765]

## EFFECT OF GEOMETRIC CHARACTERISTICS OF HOLLOW FIBER ON ITS PRODUCTIVITY AND SELECTIVITY IN EQUIPMENT FOR OSMOSIS PROCESS

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 2, Feb 84 pp 110-111

SUKHOV, G.D., BAKUNOV, V.A. and PEREPECHKIN, L.P.

[Abstract] Reverse osmosis equipment employing hollow fiber membranes is now widely used for desalination of sea and other salt water, the high packing density of the membranes and the lack of a drainage system making it desirable. The geometric dimensions, i.e., channel diameter and length of the fibers affect the productivity and selectivity of the membrane. Equations published in foreign literature correlating the geometric characteristics of a hollow fiber to its productivity and selectivity are not suitable for domestically produced fibers. In the present work a quantitative relationship of fiber parameters was developed for a fiber produced at the "Khimvolokno" Scientific Production Association. An equation is presented for calculating fiber productivity from working pressure, difference in osmotic pressures of initial solution and filtrate, diameters of channel and fiber, and length of fiber. This equation may be used in the design of reverse osmosis equipment. Figures 3; references 3 (Western). [204-12765]

UDC 662.74:628.543.12:543.257.1(546.171.1+547.562)

## SYSTEM ANALYSIS OF WATERS FROM COAL-TAR CHEMISTRY PRODUCTION

Moscow KOKS I KHIMIYA in Russian No 3, Mar 84 pp 25-31

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[Abstract] A system approach to analysis to differentiate sulfides, cyanides, free ammonia, ionic forms of carbon dioxide and other organic bases can provide a broader and more precise picture of combined coal-tar substances. The present article reports on an accelerated system analysis without distillation of the  $\text{NH}_4^+$  subsystem ions and the sum of single- and multi-atom phenols. Terminological inaccuracies in treating ammonia in solutions, such as disagreements on the existence of volatile free ammonia and ammonia salts, and measurement of free ammonia by distillation, are discussed. The present system analysis is founded on determining chemical form variations in ammonia, free  $\text{NH}_3 \cdot n\text{H}_2\text{O}$  and  $\text{NH}_4^+$ , based on the presumption that measurement of  $\text{NH}_3$  will determine total ammonia content. The strength of acid-base groups is dependent on solvents, so that water-acetone and W-Ag/AgCl electrodes were varied to establish final points of potentiometric titration. A 1 : 8 ratio of water to acetone permitted a potential jump to 200 millivolts. Further studies of details of titration indicated that

the optimum ratios for solvents were 1 : 2 to 1 : 4 water : acetone. A 3-5-fold excess content of strong acid compared to  $\text{NH}_4\text{HCO}_3$  eliminated the interference of  $\text{CO}_2$  in titration of  $\text{NH}_4^+$  salts. The method of analysis and examples of its results are summarized. It was found accurate in measuring volatile (free) ammonia, and useful in determining rough content of ammonia bound to strong acids. Various short-cuts may be used to measure, for example, only the phenol content of a solution. Figures 5; references 23: 21 Russian, (2 translations from French), 2 Western.  
[203-12131]

UDC 66.081.32:628.543

#### REMOVAL OF VINYL CHLORIDE AND DICHLOROETHANE FROM WASTE WATERS BY ACTIVATED CHARCOAL ADSORPTION

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 3, Mar 84 pp 148-149

KOCHETKOVA, R.P., KREYCH, Z.A., EPPLE', S.A., SEREBRYAKOV, V.F. and NIZHEGORODTSEV, V.I.

[Abstract] Comparative studies were conducted on the effectiveness of imported and Soviet (SKT, AR-3, AG-3, KAD-Iodide) activated charcoals in the removal of vinyl chloride (VC) and dichloroethane (DCE) from waste waters produced by organochlorine plants. Although the adsorptive capacity of the foreign product exceeded that of the Soviet preparations, the latter can readily be utilized since regenerative techniques can be employed. Electro-regeneration of VC- and DCE-saturated charcoals (8 V, 4-4.5 A, steam temperature 70-80°C, 30 min operation) was fully effective with the test samples, giving complete recovery of adsorptive capacity. It is estimated that the use of Soviet charcoals, in combination with regeneration schemes, will decrease the cost of purifying 1 m<sup>3</sup> of waste water 28-fold. References 5: 3 Russian, 2 Western.  
[238-12172]

UDC 66.085.3 :628.543

#### IONIZING RADIATION TREATMENT OF ALKALINE SULFUR EFFLUENT

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 3, Mar 84 pp 149-150

PETRYAYEV, Ye. P., GERASIMOVICH, O.A., KOVALEVSKAYA, A.M., PLYUTO, I.Ch. and SHLYK, V.G.

[Abstract] Gamma irradiation (<sup>137</sup>Cs source with 52 rad/sec output) in combination with aeration was shown to be the most effective method for the treatment of alkaline sulfur effluent. At ca. pH 7.5 and a temperature of 35-40°C, 78% of the sulfides were removed after a single 30 min irradiation treatment with conversion of the sulfides into nontoxic or low-toxicity

thiosulfate, sulfite and sulfur, and release of hydrogen sulfide into the atmosphere. Additional studies demonstrated that 80% evaporation of the effluent resulting from ethylene production and irradiation (0.19 Mrad absorbed dose) of the condensate results in recovery of bulk containing 55 gm/liter of sodium sulfide, 105 gm/liter carbonates and 170 gm/liter alkali. The condensate can be returned into the manufacturing process, while the bulk byproduct can be utilized in the paper/cellulose industry. Figures 1; references 7: 6 Russian, 1 Western.  
[238-12172]



MISCELLANEOUS

UDC 661.718.5

FEATURES OF SILICON DISSOLUTION UNDER ETCHING CONDITIONS OF STRUCTURES WITH p-n TRANSITIONS

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 2, Feb 84 (manuscript received 9 Sep 82) pp 275-280

IZIDINOV, S.O., PETRIN, A.I. and BLOKHINA, A.P.

[Abstract] The dissolution kinetics of n- and p-zones during etching of a p-n transition surface of a silicon diode structure with HF, HNO<sub>3</sub> and acetic acid was studied. Galvanic couples formed during the process inhibit dissolution on the n-base and accelerate etching on the p-layer. Nickel and iron impurities from abrasive powders also precipitate upon the n-base surface to form galvanic couples and a layer of amorphous silicon resulting in a matte surface section which markedly worsens the p-n transition parameters. It is possible to even out the etching velocities in the transition zones by compensating the electron-hole current through the transition with an external current. Differences in etching velocities become much less during intense exposure of surfaces in the p-n transition and with an increase in concentration of nitric acid reduction products in the etching solution. Etching selectivity of the p-zone increases with external anode polarization of this zone, or cathode polarization of the n-base. Figures 5; references 15: 11 Russian, 4 Western.  
[201-12765]

UDC 541.135.5

INFLUENCE OF GELATINOUS ELECTROLYTE ON ELECTRODE CHARACTERISTICS IN LEAD BATTERIES

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 57, No 2, Feb 84 (manuscript received 31 Jan 83) pp 432-435

GRIGALYUK, N.K., CHIZHIK, T.P. and AGUF, I.A.

[Abstract] A gelatinous electrolyte is normally used in the design of air-tight lead acid batteries with finely dispersed silicon dioxide as the

gel-forming additive. A comparative study of the behavior of lead and lead dioxide electrodes in liquid and gelatinous sulfuric acid electrolyte shows that the gelatinous electrolyte causes a 19% growth in discharge capacity of the negative electrode and a 14% decrease in discharge capacity of the positive electrode with no noticeable effect on the charging characteristics of the electrodes. Figures 3; references 4 (Russian). [201-12765]

UDC 631.375

#### STUDY OF GAS DYNAMIC CO<sub>2</sub>-LASERS ON MIXTURES WITH HIGH CONTENT OF HYDROGEN

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 3, No 3, Mar 84 (manuscript received 27 Oct 82) pp 405-413

DOROSHENKO, V. M., KUDRYAVTSEV, N. N. and NOVIKOV, S.S., Institute of Chemical Physics, USSR Academy of Sciences, Moscow

[Abstract] A systematic study was performed on optimization of the parameters of gas dynamic CO<sub>2</sub> lasers (CO<sub>2</sub>-GDL) which indicated conditions under which relatively high values of amplification index  $K = 0.4-0.5 \text{ m}^{-1}$  could be reached in chemically-reactive mixtures (CO<sub>2</sub>+N<sub>2</sub>+H<sub>2</sub>) containing high levels (40-50%) of molecular hydrogen. The  $K_0$  values obtained were adequate for assured realization of the generation pattern. In practical realization of CO<sub>2</sub>-GDL on hydrogen containing mixtures, an increase of gas pressure in the pre-nozzle area was indeed achieved. Optimal pressure and temperature for this action were 2.5 atm and 1100 K respectively, considerably lower than in the system of CO<sub>2</sub>-N<sub>2</sub>-He(H<sub>2</sub>O). A theoretical model for the performance of CO<sub>2</sub>-GDL was developed showing good correlation with experimental data in a wide range of operational parameters of the studied lasers with high levels of molecular hydrogen. Figures 5; references 22: 10 Russian, 22 Western (1 by Russian authors). [200-7813]

UDC 577.15.035

#### LIGHT SENSITIVE ENZYMIC MATERIAL

Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA: KHIMIYA in Russian Vol 25, No 1, Jan-Feb 84 (manuscript received 13 Jan 83) pp 3-11

KAZANSKAYA, N. F., MKHITAROV, R. A., NIKOL'SKAYA, I. I. and PETROVA, V. V., Department of Chemical Enzymology

[Abstract] A light-sensitive enzymic material was produced based on UV activation of inactive light sensitive derivatives of proteolytic enzyme  $\alpha$ -chymo-trypsin: cis-cinnamoyl- $\alpha$ -chymotrypsin (cis-CCh) and cis-nitrocinnamoyl- $\alpha$ -chymo-trypsin (cis-NO<sub>2</sub>CCh).. These materials were

synthesized by acylation of the enzyme with a photostationary mixture of cis- and trans-cinnamoylimidazole. Optimal synthesis conditions were described for obtaining these derivatives with minimal enzymic activity needed for embossed imaging. To immobilize the light-sensitive component in gelatin, the following tanner was used: sodium salt of 2,4-dichloro-6-hydroxytriazine-1,3,5. Light sensitivity, stability and resolution of this enzymic material were studied showing a number of advantages over existing photographic materials: no silver was used up, no new machinery was required, development of the films did not use expensive chemicals and the material was nontoxic. Figures 4; references 20: 8 Russian, 12 Western (1 by a Russian author).  
[199-7813]

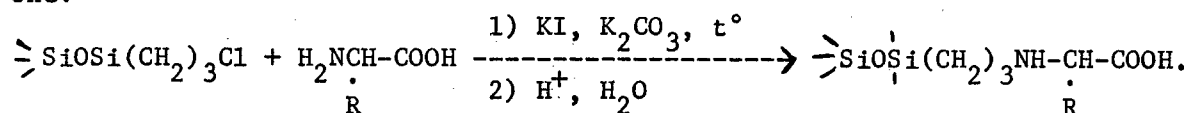
UDC 535.56,547.466

#### CHEMICAL GRAFTING OF OPTICALLY ACTIVE AMINOACIDS ON SURFACE OF SILICA

Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA: KHIMIYA in Russian Vol 25, No 1, Jan-Feb 84 (manuscript received 28 Sep 82) pp 80-85

MALINOVSKIY, V. A., STAROVEROV, S. M. and LISICHKIN, G. V., Department of Petroleum Chemistry and Organic Catalysis

[Abstract] Chemical grafting (heterogenization) of optically-active amino acids on the surface of silica was studied. Literature data were evaluated on three possible approaches, selecting the following method as the optical one:



In this fashion the following aminoacids heterogenized on silica were obtained: L-alanine, L-asparatic acid, L-asparagine, L-hydroxyproline, L-phenylalanine, D-valine and L-lysine. The silica in this reaction was modified with gamma-aminopropyltriethoxysilane, gamma-glycidoxypropyltriethoxysilane or gamma-chloropropyltrichlorosilane. Figures 2; references 7: 1 Russian, 6 Western.  
[199-7813]

## INSERTION OF METAL HALIDES INTO GRAPHITE UNDER HIGH PRESSURE

Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA: KHIMIYA in Russian Vol 25, No 1, Jan-Feb 84 (manuscript received 9 Nov 82) pp 98-103

MUKHANOV, V. A., AVDEYEV, V. V. and SEMENENKO, K. N., Department of High Pressure Chemistry and Physics

[Abstract] In spite of many studies devoted to synthesis of graphite insertion compounds (GIC) of various metal halides, very little attention was given to the effect of high pressures of halogen on the insertion of metal halides into the graphite surface and to the composition of the compounds formed. The present study was aimed at answering some of the questions on the above problems. It was shown that high pressure of halogen plays an extremely important role in this process. Using high pressures, it was possible for the first time to synthesize first degree GIC's of Bi(III), In(III), Zr(IV) chlorides, second degree GIC's of Zn(II), Hg(II), Be(II), Ta(V), Te(IV), CuBr<sub>2</sub> and indium bromide. On the average, the degree of intrusion increased 1.5-2-fold. In other words, using high pressures, it should be possible to get first degree, or at least second degree GIC's of most of the chlorides and bromides which insert at all at the lower pressures and even GIC's of the so-called "non-insertive" halides like SnCl<sub>4</sub>, PCl<sub>5</sub> and AsCl<sub>3</sub>. References 11 (Western). [199-7813]<sup>5</sup>

CSO: 1841

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